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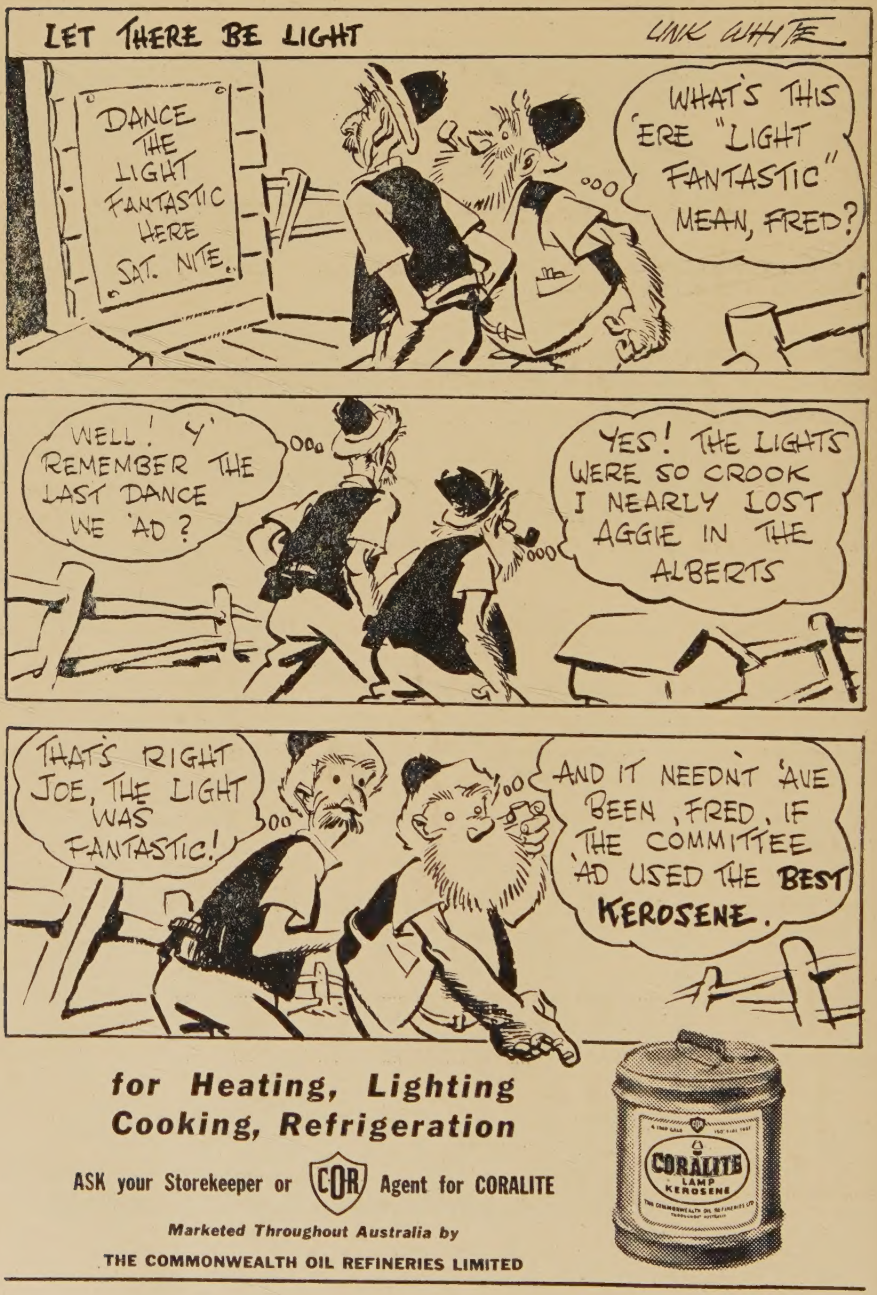
CONTENTS

		Page
REQUIREMENTS IN DESIGNING THE LAYOUT OF AND BUILDINGS FOR A POULTRY FARM	E. Lovegrove and S. Froome	213
FRUIT AND VEGETABLE SHIPMENTS TO SINGAPORE	H. R. Powell	236
THE ARGENTINE ANT	C. F. H. Jenkins	245
A CRUSH FOR THE TUBERCULIN TESTING OF CATTLE	A. Ripper	259
THE BANANA AS A HOST FRUIT OF THE MEDITERRANEAN FRUIT FLY	C. F. H. Jenkins	263
CLASSING FARMERS' CLIPS FOR AUCTION	W. L. McGarry	265
OAT AND BARLEY TRIALS, 1946–1947	....	280
THE CONTROL OF ROOT-KNOT OR EELWORM-GALL DISEASE BY SOIL FUMIGATION WITH D.D.T.	W. P. Cass Smith and H. L. Harvey	283
AUTUMN RAINFALL IN RELATION TO SPRING EPIDEMICS OF WHEAT STEM RUST	W. P. Cass Smith	291
SOIL CONSERVATION METHODS FOR CONTROL OF WIND EROSION	G. H. Burvill	293
STOCK FOODS	....	300
ANALYSES OF FEEDING STUFFS	....	309


LET THERE BE LIGHT
LINK WHITE
DANCE THE LIGHT FANTASTIC HERE SAT. NITE.
WHAT'S THIS 'ERE "LIGHT FANTASTIC" MEAN, FRED?
WELL! Y' REMEMBER THE LAST DANCE WE 'AD?
YES! THE LIGHTS WERE SO CROOK I NEARLY LOST AGGIE IN THE ALBERTS
THAT'S RIGHT JOE, THE LIGHT WAS FANTASTIC!
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JOURNAL

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WESTERN AUSTRALIA

Vol. 25. (Second Series) SEPTEMBER, 1948 No. 3

REQUIREMENTS IN DESIGNING THE LAYOUT OF AND BUILDINGS FOR A POULTRY FARM

By E. Lovegrove, Chief Poultry Adviser and S. Froome, Inspector.

THE poultry house is an important factor in the practice of poultry husbandry. If the poultry house is not designed from the standpoint of saving labour, sanitation may become so difficult for the farmer that, notwithstanding good intentions, he will fail to carry out the essential practices.

Climatic conditions vary so widely that no particular type of poultry house can be suggested as desirable for all conditions. Much research work on poultry housing is needed before facts instead of opinions can be presented.

However, there are certain essential requirements for any good poultry house. They are (1) convenience (2) durability coupled with low capital cost (3) ample ventilation (4) comfort in quarters and equipment (5) provision for ample light and direct sunlight and (6) sufficient space for the desired number of birds to be kept. Perhaps the last mentioned essential is more a matter of management. Many poultrymen crowd too many birds into a good poultry house and thus it does not meet the requirements for the maintenance of the health of the poultry flock.

The location and design of the buildings on a poultry farm should receive as much thought as a successful business man would give to the planning of a proposed new factory. In both cases location and site are of prime importance to avoid commencing with unnecessary handicaps in a business which has to sell its products in the world's markets.

LOCATION OF LAND.

In Western Australia the poultry population is mainly concentrated in three areas:—The wheatbelt, land adjacent to portions of the Great Southern railway and the greater metropolitan area. The basic reasons for these fairly well

defined areas are—The wheatbelt provides the main feeds for poultry, i.e., wheat, bran and pollard; The Great Southern area because of its climate and nearness to the wheat supplies; and the metropolitan area because of its proximity to markets and to social amenities, i.e., electricity, water supply, good roads and transport. The obvious location for the poultry industry is in the centre of the flour milling industry when it is realised that a farm carrying 1,000 layers requires about 75 tons of supplies during the year. The unimproved value of land varies considerably with the district in which it is situated. The average cost of land in a country district 60 to 100 miles from Perth would be £5 per acre, but the price in the metropolitan area would be from £10 to £25 per acre according to its situation relative to social amenities.

The factors that have been enumerated are the salient points which should be considered when the location of the future poultry farm is being decided.

SELECTING A SITE.

Suitable sites for poultry farming can be found in almost any district, but the drawbacks resulting from a bad site will be a serious handicap to success. The ideal site is, perhaps, seldom obtained, but land which approximates this ideal should be chosen and the layout planned to suit the conditions.

The main essentials are—

Accessibility for obtaining supplies and marketing produce, i.e., proximity to good roads, and near electricity supply lines.

Adequate water supply should be obtainable.

Area should be at least five acres to allow for raising young stock, growing green feed and provide for later expansion.

High ground is preferable, with a slight slope facing the east or north-east.

The slope should provide natural drainage, but too steep a gradient will be found to involve greater expense in buildings and may cause soil erosion.

The surface of the land should not be too broken or uneven. The best class of soil is sand or sandy loam but many successful poultry farmers are keeping fowls on various types of light soil.

A windbreak of trees is desirable for protection from cold winds, and shade is beneficial in summer, but the houses should not be built within a dense enclosure of trees that would stop summer breezes or shade the houses from winter sunshine.

PLANNING THE FARM LAYOUT.

It is not possible to describe the exact layout for a poultry farm because the shape of the block and its contour govern the plan, but there are certain basic requirements which can be enumerated.

Before any buildings are erected a plan should be prepared showing the farm as it would appear when fully developed. Portions of this planned layout could then be built as required with the knowledge that it was part of a concerted whole.

A point which cannot be too strongly stressed is that buildings of a well built and permanent character should be constructed. Building a poultry farm on those lines creates an asset which will be valuable many years after construction. Poultry farming should not be considered as a "get rich quick" proposition but rather as a way of life and the improved farm a permanent asset to be handed to the next generation. Furthermore, a well laid out and well constructed farm will always be saleable at a figure much in excess of one which is lacking in this respect. Another salient point is the present tendency to keep a large number of birds on a small area. The well known axiom of the Health Authorities "The more dense the population per acre the higher the possible incidence of disease" should be applied to poultry farms. More reports of disease are being received every year and many of them can be traced to infected soil, overcrowding and failing to plan the farm so that the yards can remain vacant in rotation.

The essential requirements of a well planned farm are—

1. The residence should be near the road and securely fenced in with a 6 foot wire netting fence so that the garden will be free from stray poultry. As far as finances will allow, conveniences to assist the housewife in her duties should be provided. The house has been mentioned before farm buildings because good living conditions contribute in a large degree to the ultimate success of the farm.

2. Owing to the constant attention that has to be given, not only in the day but during the evening, to incubators and brooders in the rearing season, it is good planning to have the incubator room and brooder house reasonably close to the dwelling. When a building has to be visited many times a day the distance to be travelled should be as short as possible. This leads to not only more economical but also to more efficient working.

3. The feed house with its chaffcutter, feed mixer, and grister is the distributing centre for the farm and as such, should occupy a position which will conserve time, labour and distances to be walked when feeding and cleaning.

4. Roads and lanes from the feed house to the different sections of the farm should be laid out giving special consideration to working convenience. Every detail that will save time and labour is important. The cumulative wastage of effort on a badly planned farm over one year would be enormous and would reduce the efficiency of the owner.

5. No road or lane should be less than 21 feet wide to allow of the use of vehicles for feeding and cleaning. This arrangement also prevents the close groupings of buildings, ensures a free circulation of air, and assists in the isolation of the different units should an outbreak of disease occur.

6. The section of the farm on which young stock is raised should be completely separated from the adult fowl runs and should be on higher ground so they will not be subject to the drainage from the adult birds. For successful rearing these grounds require complete resting from the end of one rearing season until the commencement of the next, and could be cultivated and a green crop planted. Of recent years it has been proved conclusively that young stock will

not thrive in yards which are used all the year round, but require what has become known as "new" ground, that is, under practical conditions "rested" ground.

7. All sheds which are intended to house poultry should face the east or north-east so that the rising sun will shine into every part of the shed. In winter this is most valuable to dry and warm the interior when the early mornings may be cold and damp for birds respond to comfortable conditions in their house. Sunlight is one of nature's disinfecting agents and helps to prevent colds and other disease attacking the flock. Probably the most severe winds come from the north-west and these would strike the poultry house on the back wall. Protection from cold winds is vitally necessary as nothing lowers egg production so much as this type of exposure.

8. As young succulent green feed forms about 50 per cent. of the poultry ration, the area reserved for growing green crops and the irrigation system which accompanies it must receive due consideration. The basic requirement in this section of the farm is the ability to produce a continuous and plentiful supply of green feed.

The preceding pages have been written to assist the person who is proposing to enter the poultry industry in the initial stages of his venture, so that he will not acquire unsuitable land. Furthermore, it is hoped that good planning will eliminate much of the drudgery attached to haphazard poultry farming, will give the farmer a better return for his labour and make him a contented and permanent poultry husbandman.

FEED ROOM, VEHICLE SHED AND EGG ROOM.

This is one of the sheds on the farm which should never house a bird and, therefore, the aim will be for a modern and well equipped building with labour saving devices. It cannot be substantiated that there is any one "best" design for this building, but for Western Australian conditions there are a few points worthy of consideration.

If the egg room is placed on the southern end it will be the coolest part of the building during the summer months. Again, if a person is to work in reasonable comfort and without unnecessary fatigue, it should not be a low type of shed but have walls 10 feet high and a gable roof. For efficient work good light is wanted, therefore, sufficient window space must be built into the walls. Figure 1 shows a suggested design which should fulfil the requirements for this building, and because of its simple construction should not be excessively costly to erect. It is suggested that the walls should be timber framing covered with asbestos cement sheets, but cement bricks or concrete walls are more durable and provided the work is done by the poultry farmer should not be much more expensive.

It will be noted that the garage for the motor truck is so arranged that the loaded truck can be driven close to the back of the feed bins and feeding materials can be tipped into the bins direct from the truck. The loading or unloading of egg cases can take place with the truck under cover, and this is

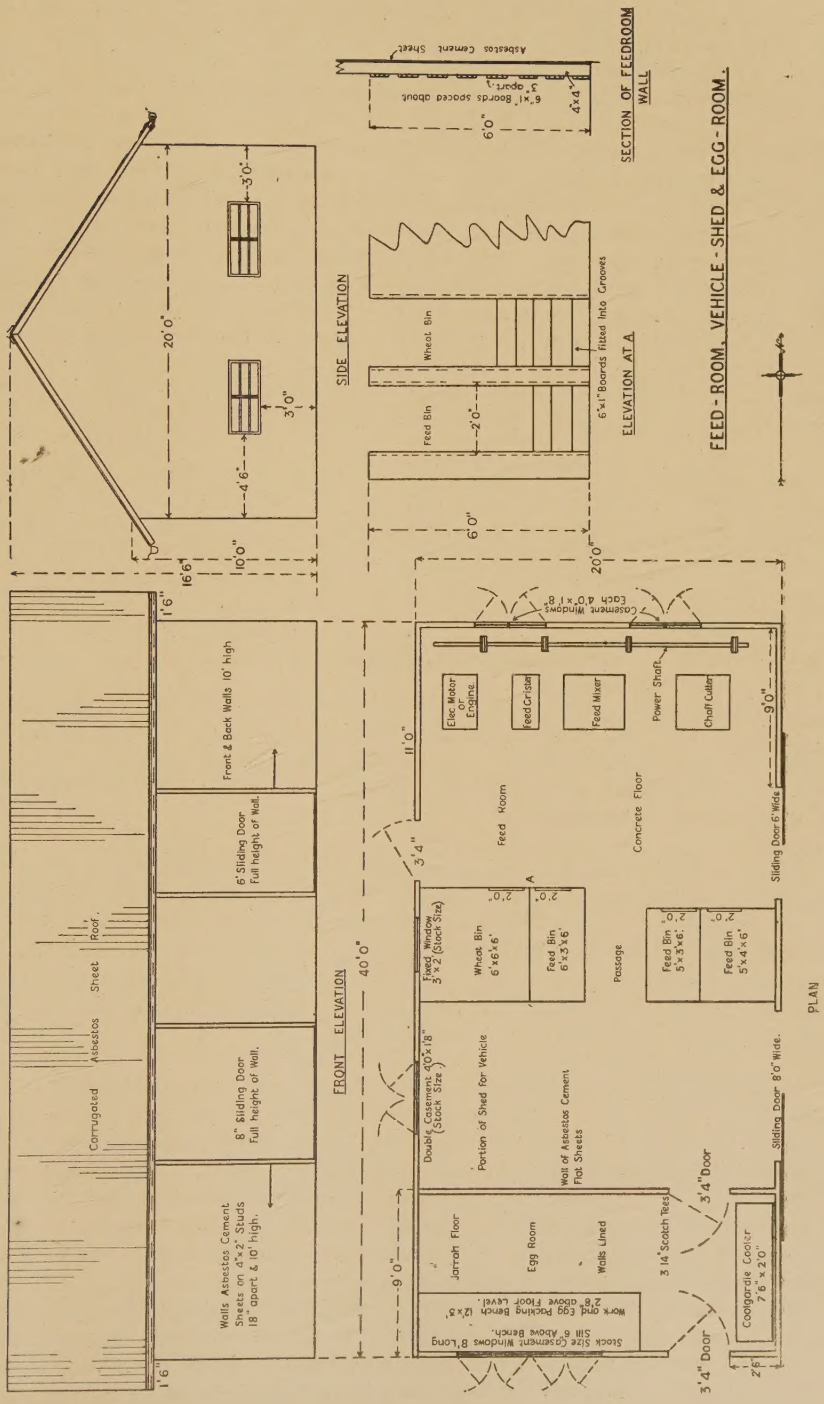

FEED-ROOM, VEHICLE-SHED & EGG-ROOM.
SECTION OF FEEDROOM WALL
Asbestos Cement Sheet
6"x1" Boards spaced about 3" apart.
4"x4"
6'0"
ELEVATION AT A
6"x1" Boards fitted into Grooves
Wheat Bin
Feed Bin
2'0"
SIDE ELEVATION
3'0"
20'0"
4'6"
16'6"
10'0"
1'6"
Front & Back Walls 10' high
6' Sliding Door Full height of Wall.
8' Sliding Door Full height of Wall.
Walls Asbestos Cement Sheets on 4"x2" Studs 18" apart & 10' high.
Corrugated Asbestos Sheet Roof.
FRONT ELEVATION
40'0"
Casement Windows each 4'0"x1'8"
Elec. Motor or Engine
Feed Cutter
Feed Mixer
Power Shaft
Chaff Cutter
9'0"
11'0"
3'4"
Feed Room
Concrete Floor
Sliding Door 6' Wide
Fixed Window 3'x2' (Stock Size)
Wheat Bin 6'x6'x6'
Feed Bin 6'x3'x6'
Passage
Feed Bin 5'x3'x6'
Feed Bin 5'x4'x6'
Double Casement 4'0"x1'8" (Stock Size)
Portion of Shed for Vehicle
Wall of Asbestos Cement Flat Sheets
Sliding Door 8'0" Wide.
PLAN
Jarrah Floor
Egg Room
Walls Lined
3'4" Door
3 14" Scotch Tees
Work and Egg Packing Bench 12'x2' 2'8" above Floor Level.
Stock Size Casement Windows 8' Long Sill 6" Above Bench.
Coolgardie Cooler 7'6"x2'0"
3'4" Door
2'6"

Fig 1.

important in the hot weather when it is essential to keep the eggs as cool as possible to preserve their quality. The different units in the feed room have been placed in their most convenient positions; the feed grister opposite the wheat bin; the feed mixer equidistant from the feed bins and the chaffcutter near the door where the green feed would be deposited.

The egg room, which is the southern portion of the building, is provided with a long window above the work bench. To ensure clean conditions for the storage, handling and packing of the eggs, the room is ceiled, lined and floored. A jarrah wood floor is suggested in the illustration because a wooden floor gives better working conditions to the packer, but a concrete floor with a "duck board" along the front of the bench is satisfactory. Space has been allotted in the egg room for a "Coolgardie cooler" as this appears to be a satisfactory method of keeping eggs cool on the farm. The detail of the wall of this feed room shows the method of protecting the asbestos sheets forming the wall, by fixing 6in. x 1in. boards to the studs. Without some protection it is most probable that the wall would be damaged within a short period.

The entrances into the feed bins are fitted with board which can be removed as the feeding material in the bin is used. The size of the wheat bin is 6ft. x 6ft. and this will hold approximately 5.2 tons of bulk or 65 bags of wheat.

HOUSING THE LAYING FLOCK.

The most popular system of housing laying birds in Western Australia is by means of the semi-intensive laying shed. This system appears to be quite suitable for the climatic conditions; the birds have large yards to use in the warm weather, and the sheds are large enough to keep the birds confined during period of inclement weather.

Four sheds of the type recommended by this Department will provide accommodation for 1,200 layers. Each shed is 64ft. x 16ft. and is divided into two equal portions; each portion will comfortably house 150 laying birds. It has been found in practice that units of 150 birds can be economically handled, being small enough in case of an outbreak of disease, and yet not too small to make the labour involved too expensive. A suggested layout for the sheds using the double yard system, is shown in Fig. 2.

Many commercial poultry farms near Perth have been established on land which is too small for the purpose; consequently, when the poultry farmer increased his flock he has been forced to have a high concentration of stock per acre, with the resultant higher incidence of disease. The principles of poultry husbandry indicate that not more than 1,000 birds to the acre should be kept under the semi-intensive system and the suggested layout in Fig. 2 conforms to that requirement. The double yard system allows each yard to be empty for six months, the yard ploughed and a green crop grown. The birds would be running on fresh ground every six months and with this arrangement the soil should not become contaminated. It will be noticed that each double unit of 300 birds is housed separately, and should an outbreak of disease occur it is possible to completely isolate any unit by closing the yards surrounding that unit.

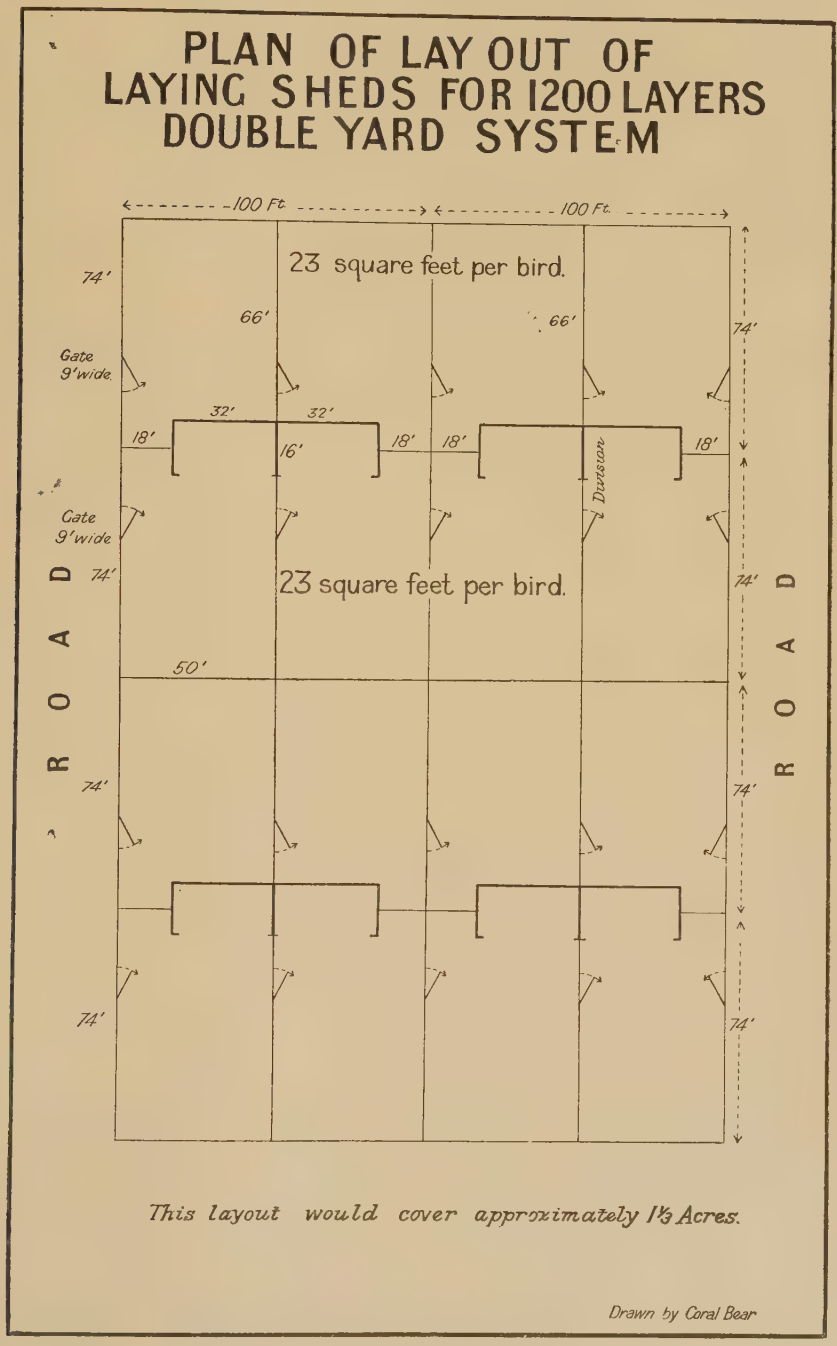


Fig. 2.

Quick servicing of the laying flock is made possible by the wide gates in each yard which allow a vehicle to be taken around the sheds and the feeding done in one trip from the feed shed.

THE SEMI-INTENSIVE LAYING SHED.

Figure 3 is the ground plan of one half of a laying shed, that is, a portion 32ft. x 16ft. capable of housing a unit of 150 layers. The second portion of the shed is a repetition of the part shown in the plan. Figures 4, 5 and 6 show the construction of the shed and are self-explanatory, but there are a few special points which should be noted.

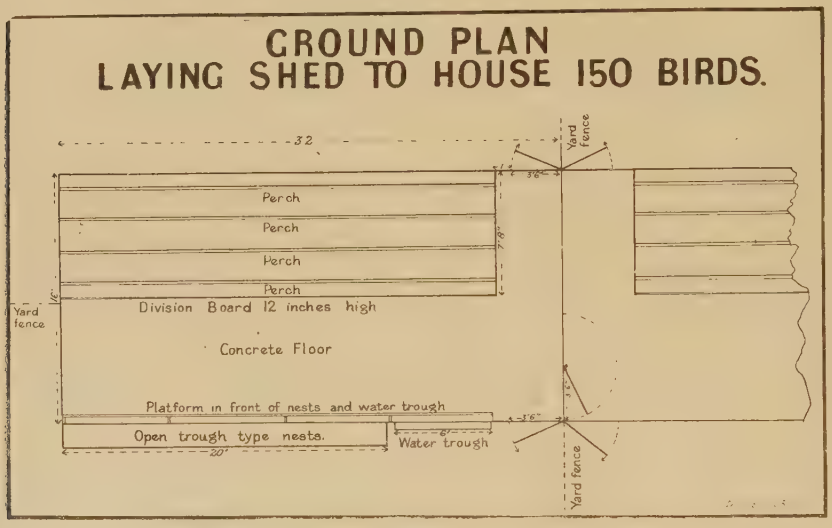


Fig. 3.

It is essential that the surface of the concrete floor should be at least 4ins. above the ground level to ensure that the floor will be dry during wet weather. It has been found that erecting the framework of the shed on the top of a concrete wall standing 6ins. above the floor level makes a substantial foundation, keeps the litter in position and facilitates efficient cleaning. At the top

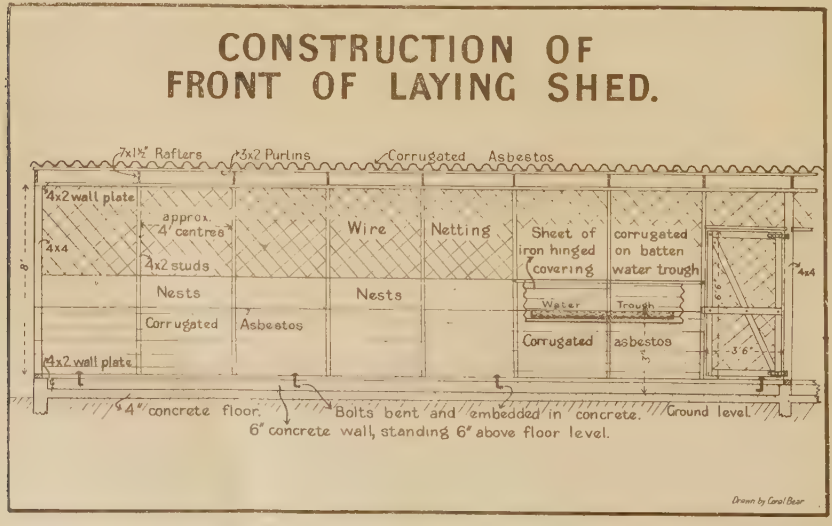


Fig. 4.

of the back wall the space between the wall plate and the purlins provides ample ventilation, but the board supporting the gutter prevents rain driving into the shed. The lower half of the back wall of the shed should be wire netted to confine the birds in the shed when the flaps are lifted during hot weather.

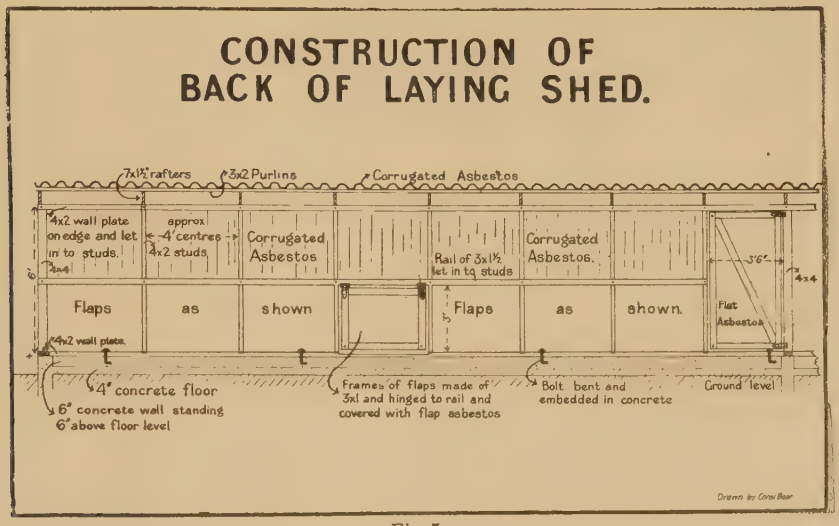


Fig 5.

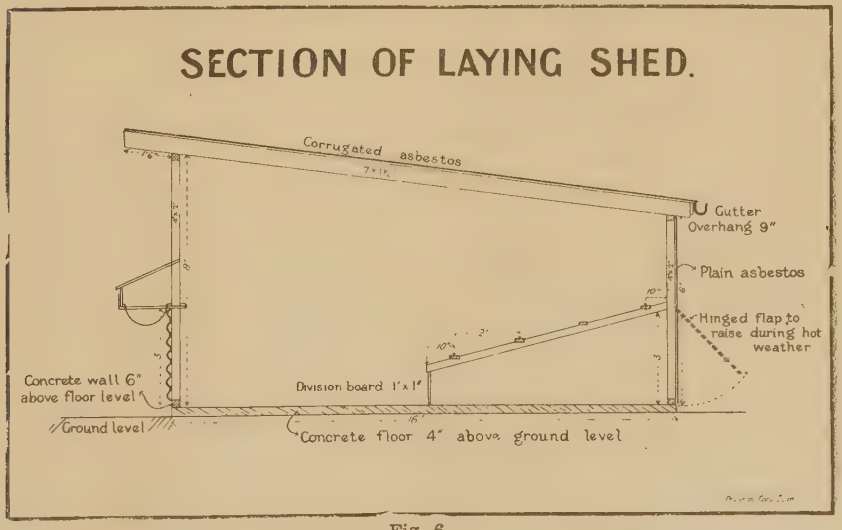


Fig. 6.

The nests and the water trough are on the outside of the front of the shed, but the birds approach these by a platform running along the inside of the shed at the same level. The birds have access to the water through a long narrow opening cut in the wire netting covering the front of the shed. The nests are simple troughs, each trough being approximately 3ft. 8ins. in length, 1ft. 3ins. wide at the top and 11ins. in depth. The trough is divided into three equal sections by two wooden divisions so that the top of each nest

is 1ft. 3ins. by 1ft. 2ins. Each trough rests on 3in. x 1in. battens and can be removed for cleaning by lifting out between the studs supporting the front of the shed. Details of the construction of the nest are given in Fig. 7.

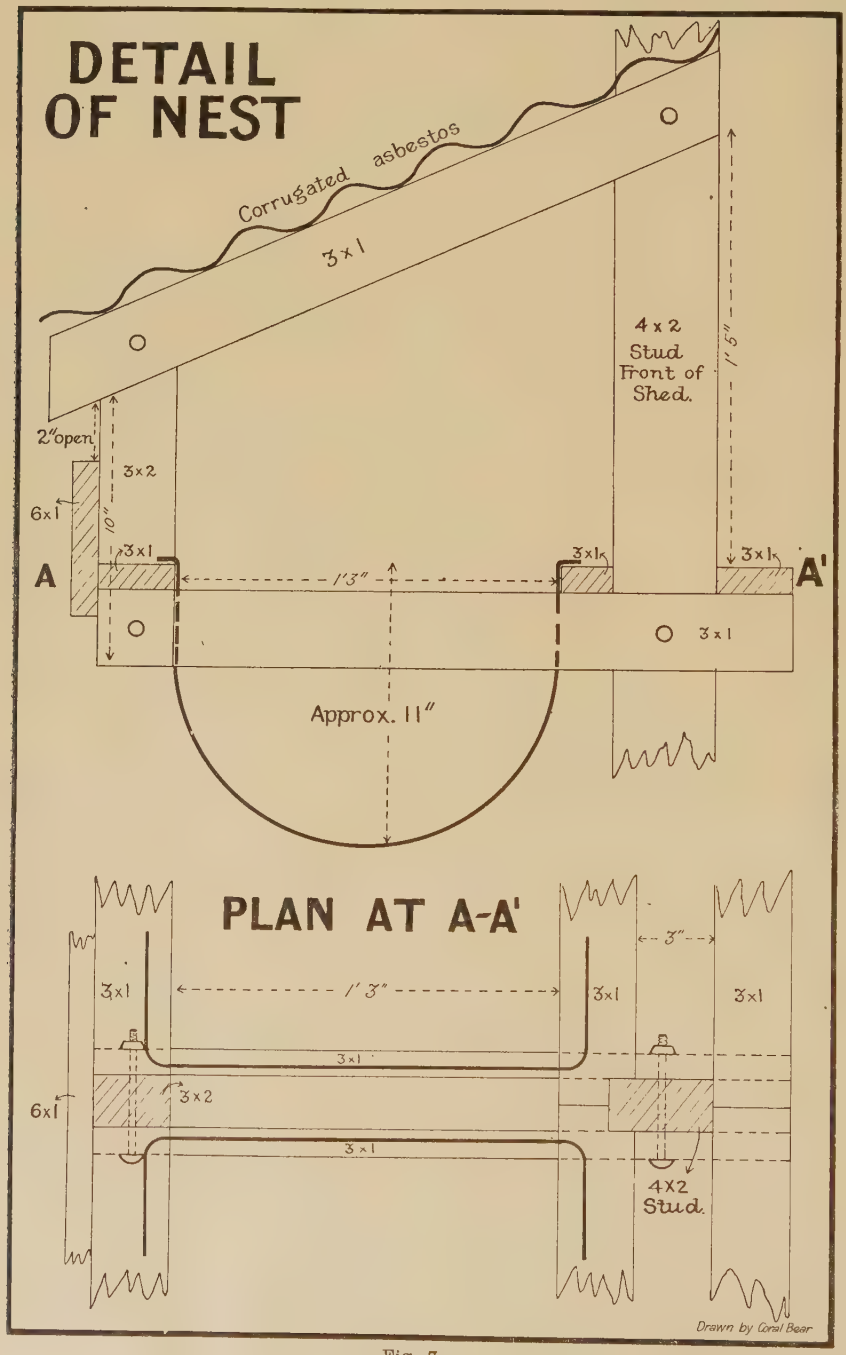


Fig. 7.

It is an advantage to construct the platform in front of the nests in such a manner that it is hinged to the shed and can be lifted up to cover the opening into the nests and so prevent birds roosting on it or in the nests at night time.

Figure 6 clearly shows that the ladder type of perch is recommended for these sheds. The bearers supporting the perches are hinged to the studs of the back wall by a bolt which allows the entire set of perches to be raised and fastened to the rafters during cleaning operations. Wire netting should be fastened to the underside of the perch bearers to prevent the birds getting to the manure below the perches.

THE INTENSIVE LAYING SHED.

As previously stated, the most popular system of housing the layers in Western Australia is the semi-intensive method, but throughout Australia there are a small number of intensive sheds. The birds are housed in one large shed; yards are not provided and the birds are not exposed to varying weather conditions. Provided the pens and nests were kept in a clean condition, this system should produce clean eggs.

Figures 8 and 9 are outline plan and sketches of an intensive shed to house 1,200 layers. The shed is divided with wire-netting partitions into compartments to hold 50 to 60 birds allowing approximately four square feet of floor space to each bird.

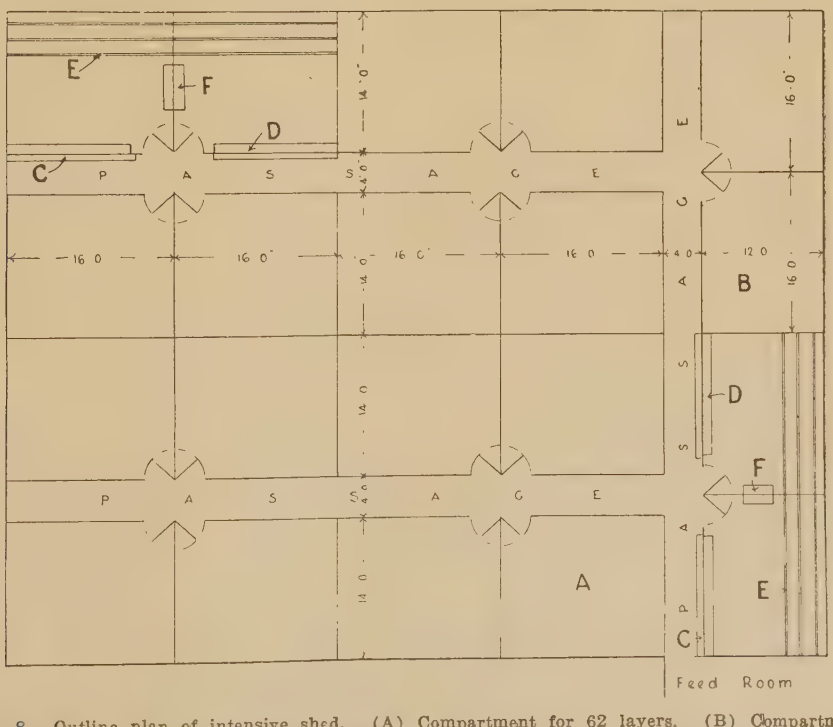


Fig. 8.—Outline plan of intensive shed. (A) Compartment for 62 layers. (B) Compartment for 52 layers. (C) Water and feed troughs. (D) Nest boxes 24 inches above floor level. (E) Perches. (F) Dry feed hoppers.

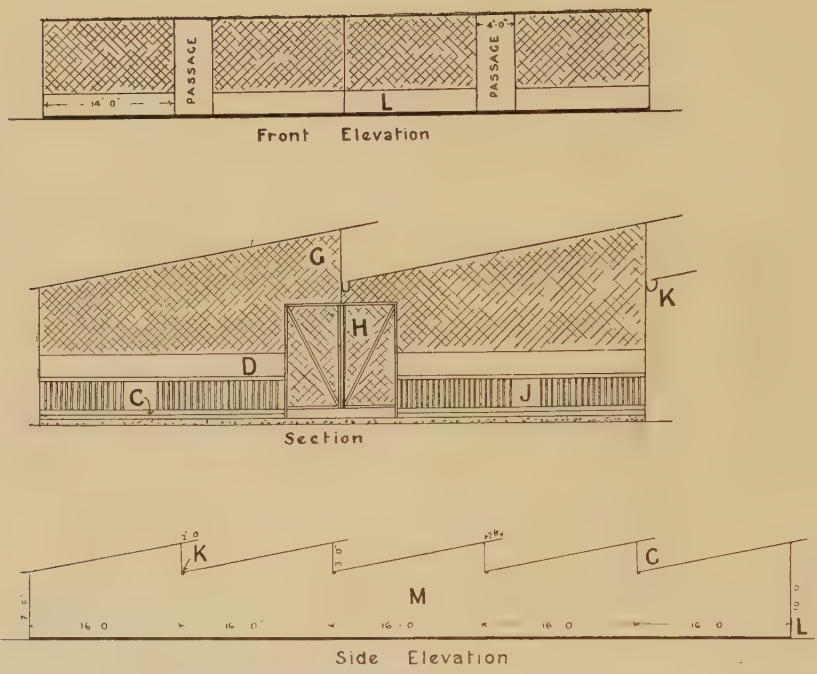


Fig. 9.—Intensive shed, front and side elevation and section. (C) Water and feed troughs. (D) Nest boxes 24 inches above floor level. (G and H) Wirenetting. (J) Wooden slats above a 6 inch board. (K) Gutter. (L) Corrugated iron sheet on edge. (M) Sides of shed totally enclosed.

This type of building has two salient points—the work of feeding, cleaning and collecting eggs is all done under cover and as the poultry farmer increases his flock further sections can be added to the front of the existing building. Good management is necessary to make a success of this system of poultry keeping. The operator must be always alert and watch for any sign of deterioration in his flock and he must be skilful and careful in feeding the layers to maintain high production.

It is the usual practice with the sawtooth type of intensive shed to commence by building two sections. The back section consists of four pens, each capable of housing 52 birds and a four ft. wide passage in front of the pens. This section is often extended at one end for several feet to form the feed room.

The second section as shown in Fig. 8 is divided into four compartments, each 16ft. x 14ft. and each capable of housing 62 birds. It will be noted that the pens are serviced by two passages running at right angles to the original passage. Further extension of the shed is obtained by the addition of sections similar to the second section erected.

The divisions between the pens consist of one sheet of corrugated iron on edge, which prevents ground draughts, and wire netting above.

Figure 9 shows that each section of the shed is 10ft. high in the front and 7ft. at the back. This forms an open space of 3ft. along the top of the front of each section to admit sunlight and allow ample ventilation. The space is wire netted and it protected from the weather by the roof which projects 2ft.

The section in Fig. 9 shows the construction of the pens along each side of the passages.

Figures 10 and 11 are reproductions from photographs in "Poultry Farming" published by the Department of Agriculture, Victoria. Fig. 10 shows a model of a "saw-tooth" type of poultry house and Fig. 11 is a poultry shed on Mr. R. J. Jelbart's farm, Eltham. The front was closed in with a glass cloth, as the front section was being used as a brooder house. (Top photo. page 96 and photo. page 97 "Poultry Farming" Dept. of Agric. Victoria.)

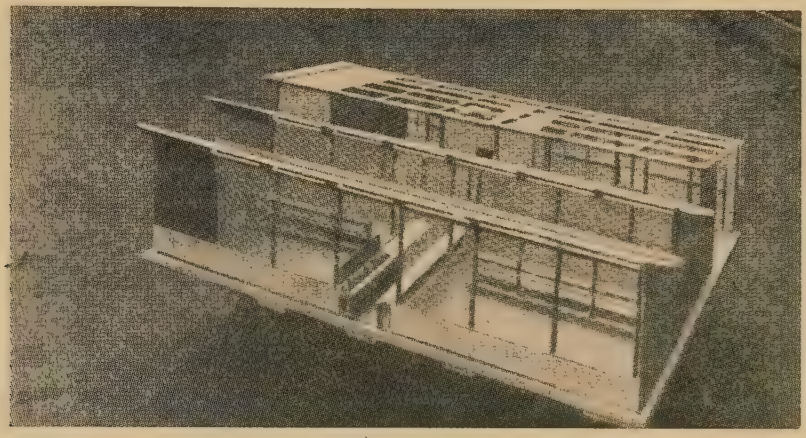


Fig. 10.

LAYING CAGE BATTERIES.

Individual cages for the laying hen have been in use in some countries for several years. In the U.S.A. they have been in use on some poultry farms for over 15 years and it is still debatable whether the advantages can outweigh the disadvantages and if the use of batteries will become popular and permanent. At the C.S.I.R. Poultry Research Centre at Werribee, Victoria, trapnesting, single testing pens, and laying batteries are being used for artificial insemination and recording production. Up to the present, the research officer in charge thinks the batteries are the best.

The size of each individual cage and the number cages in a battery appear to vary considerably, but a survey of several reports indicates that the average size battery is three tiers of cages high (about 6ft.) and 18 to 24 cages long. Each cage is approximately 12ins. wide, 18ins, from front to back and 17ins. high. The floor of the cage consists of wire bars about an inch apart and the droppings collect on trays or on a conveyor belt below the floor. Feed troughs are fixed to the front of the cages, and water is made available by long troughs running the full length of the battery, or, as at Werribee, the cages are fitted with the "Henpex" drinking system. The wire floor slopes to the front and the eggs roll into a tray in the front of each cage.

Laying batteries have a number of advantages: Individual egg production records can easily be kept, the vices of feather picking and cannibalism are eliminated, and early and easy culling is made possible. Owing to the cost of installing the batteries and the culling of many birds because of poor production, it is necessary to have a supply of replacement birds if the battery is to

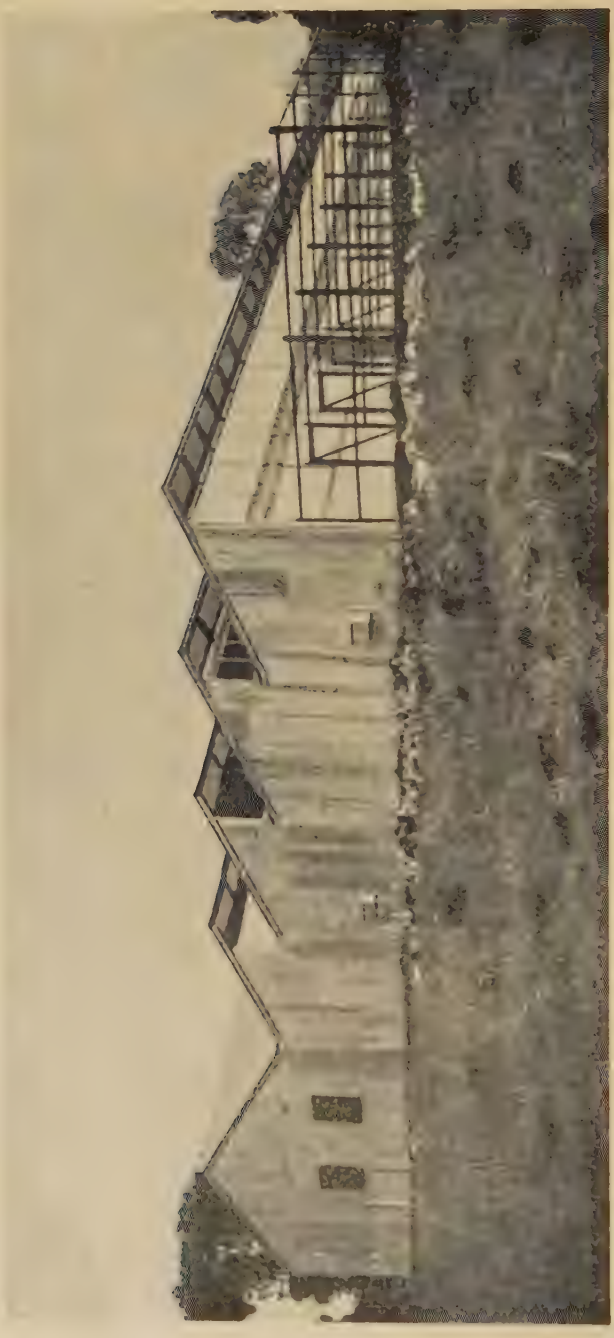


Fig. 11.

be a financial success. No cage should be left empty because the greater the labour requirements for servicing as compared with a semi-intensive shed makes it imperative for every cage to produce its quota of eggs.

Greater skill and care in feeding is required for layers in batteries, but under normal conditions of cleanliness a high percentage of clean eggs, fit for export, should be produced.

THE INCUBATOR AND BATTERY BROODER ROOMS.

To operate an incubator or battery brooder with ease and accuracy, it is necessary to have correct room conditions and many differently constructed rooms will be found satisfactory.

The principal requirements are a reasonably uniform temperature and humidity, and ample ventilation to bring fresh air into the room and remove the used air.

To prevent sudden changes of incubator room temperatures, the room should be ceiled and lined and constructed of material that will not react suddenly to changes of atmospheric temperature. Ventilation can be provided by means of properly arranged windows and by special ventilators. Ventilation assists in temperature and humidity control, more air being needed in warm weather and less in cold weather.

Figure 12 is the outline plan of a building designed to contain an incubator room, a battery brooder room, and a service room. The main entrance to the building is by a 6ft. sliding door "M" into the service room which is 15ft. x 9ft. This room provides storage space for chicken boxes and eggs awaiting incubation and is fitted with a tank "D," 4ft. x 4ft. x 2ft. 4ins., for cleaning and disinfecting incubator trays. The outlet from the tank goes through the wall and empties into a drain. A bench "E," 5ft. x 3ft., adjoins the tank and the top of the bench projects an inch over the tank and slopes slightly toward that end. A louvred winder "H" is immediately above the bench and tank.

From the service room a 4ft. sliding door gives entrance to the incubator room which is 18ft. x 15ft. in size. A room of this size will conveniently house a 6,300 egg capacity incubator "B" and a 2,700 egg hatcher "C" and leave ample space for the work connected with chicken hatching. The room has a concrete floor, is lined and ceiled and a 8ft. x 3ft. casement window "G" above the bench "A" provides good lighting conditions and if necessary, some ventilation. A dark curtain can be drawn across the window when it is desired to darken the room.

The bench "A" is 10ft. long x 3ft. wide and 4ft. from the end a narrow slit in the bench top is fitted with a glass panel. A bright light below the panel allows rapid candling of eggs before and during incubation. So that hygienic conditions can be maintained during chick sexing operations a small metal sink is fitted at the most convenient position on the bench. The outlet from the sink discharges into a drain outside the building and the flow of water carries away the excreta from the chicks being sexed.

A 4ft. wide sliding door "L" connects the incubator room with the battery brooder room which is 15ft. by 9ft. This room is capable of accommodating two 4-tier battery brooders "F," each of which are approximately 6ft. x 2ft. 6ins. The floor is concrete and the room is ceiled and lined, and a casement window "K" gives sufficient light. It is not advisable to have a window in such a

position that sunlight will fall on the battery brooder as it may lead to toe picking and cannibalism. A stock size ledged and braced door "N" leads to the open air.

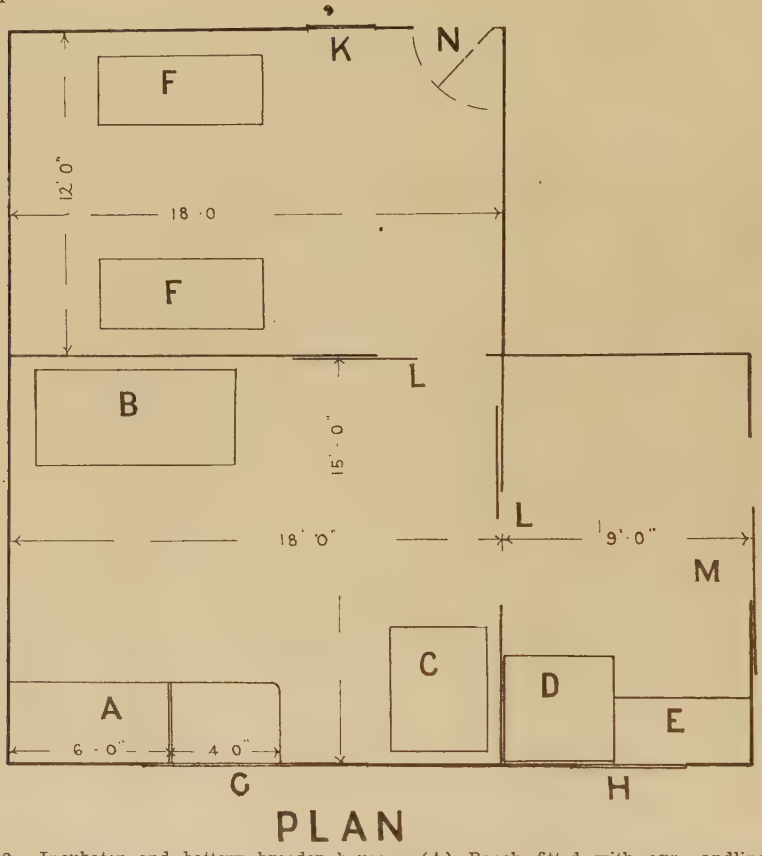


Fig. 12.—Incubator and battery brooder house. (A) Bench fitted with egg candling device. (B) 6,300 egg capacity incubator. (C) 2,700 egg capacity hatcher. (D) Tank for washing and disinfecting incubator trays. (E) Bench 5ft. by 3ft. adjoining tank. (F) Battery brooders. (G) Casement window. (H) Louvre window. (K) Casement window. (L) 4ft. sliding door. (N) Ledged-braced door (stock size).

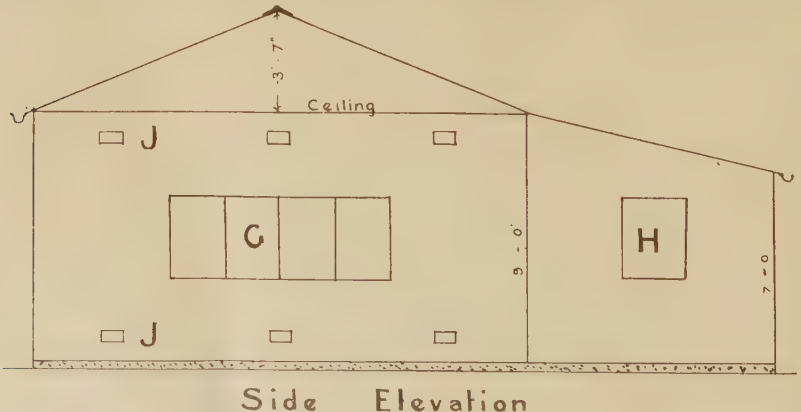


Fig. 13.—Side elevation incubator and battery brooder house. (G) Casement windows 8ft. by 3ft. (H) Louvre window.

Figure 13 shows the side elevation of the building the important point being the arrangement of the ventilators "J" "J" in the incubator room. These are placed as near as possible to the ceiling and floor respectively.

Figure 14 shows the hatcher in the corner of the incubator room on Mr. M. Stocker's "Cavvystock Poultry Farm" at Roleystone. The right hand side of the picture depicts the corner of the bench, a portion of the window above

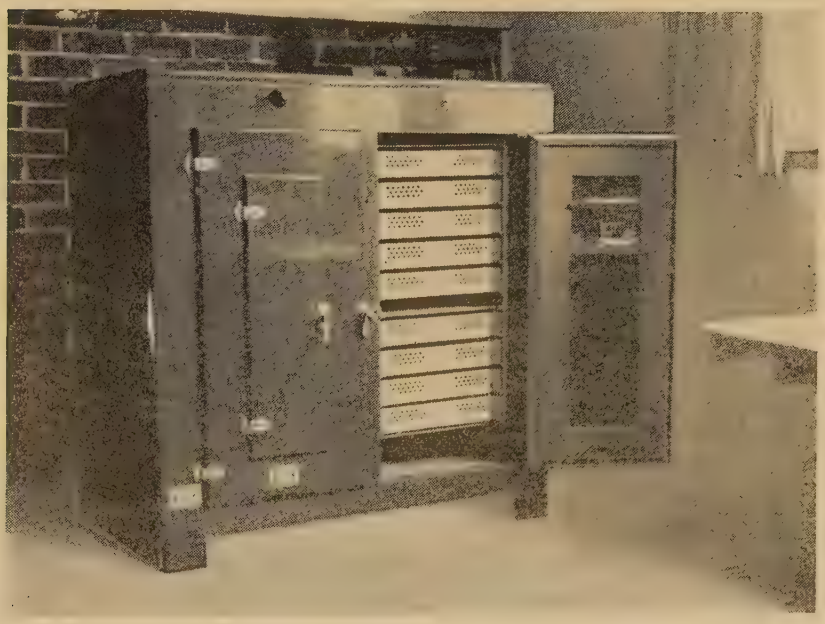


Fig. 14.

the bench and the curtain used to darken the room. The plan of the incubator room given in Fig. 12 closely follows the design of the room in Fig. 14. The substantial build and well finished appearance is clearly shown in the photograph.

THE COLD BROODER HOUSE.

When the chickens leave the battery brooder they should be placed in cold brooders and Figs. 15, 16, 17, and 18 illustrate the type of cold brooder house recommended. Fig. 15 is a plan of the building, which is 46ft. long x 18ft. wide and provides for 10 cold brooders each holding 80 chicks from three to six weeks of age. A passage 4ft. wide along the back of the brooders and another passage 6ft. wide between each set of five brooders, facilitates the servicing of the brooders. Each brooder and section of the brooder house is 4ft. wide and Fig. 16 shows the construction of each division. It will be noted that a sheet of asbestos "A," 4ft. 6in. x 2ft. 6in., forms the division immediately next to the brooder to prevent the possibility of sweeping ground draughts, but the remainder of the divisions and above the brooders is wire netted.

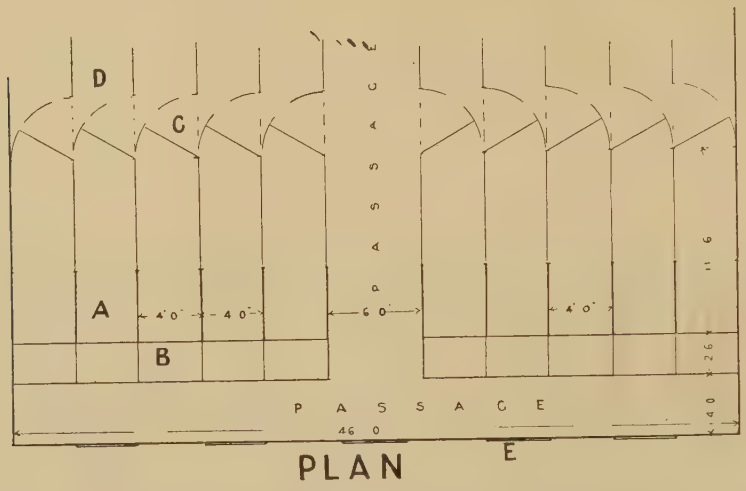


Fig. 15.—Plan of cold brooder house. (A) 4ft. wide section of the brooder house. (B) Series of cold brooders. (C) Wire netted gates leading to outside runs. (D) Outside runs. (E) Stock size windows hinged at top or louvre windows.

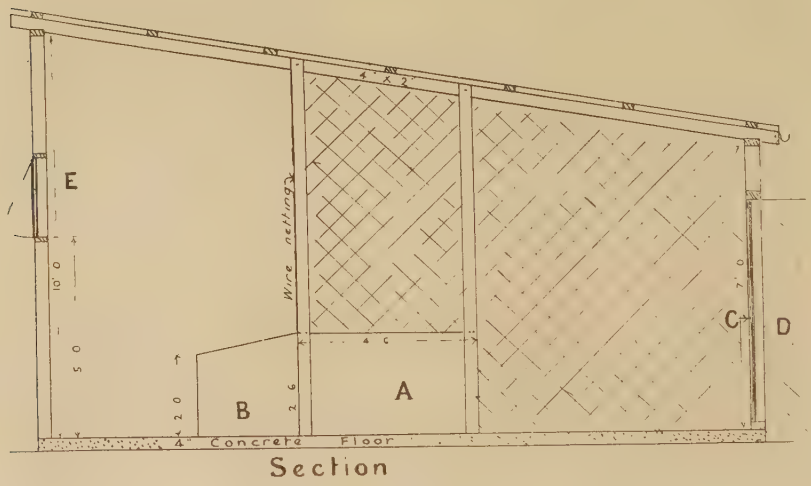


Fig. 16.—Section of cold brooder house. (A) Asbestos sheet to prevent drarghts. (B) Cold brooders. (C) Wire netted gates leading to outside runs. (D) Outside runs. (E) Stock size windows hinged at top or louvre windows.

The building is 10ft. high in the front and 7ft. high at the back and is principally constructed of 4in. x 2in. timber. The front and both ends are completely enclosed except that a series of windows are placed in the front wall; the lower edge of the windows "E" being 5ft. above floor level. The floor is concrete raised 4in. above ground level to ensure dry conditions for the chickens. The back of the house is wire netted above the gates "C" which when opened form the gates to the outside runs.

The outside runs "D" should be overhead netted to prevent the destruction of the chickens by crows or other pests.

A description of the construction of the cold brooders is given in leaflet No. 888 which is available at this Department. Fig. 17 shows the exterior of the long cold brooder house on Mr. Stocker's farm and Fig. 18 is a portion of the interior of the same building showing the general arrangement of the internal fittings.

Fig. 17.—Exterior of cold brooder house on Mr. Stocker's farm.

Fig. 18.—Portion of the interior of the cold brooder house.

THE BROODER HOUSE.

The previous sections dealt with the buildings necessary for a battery and cold brooder system of brooding chicks, but if it is desired to use other types of brooders, the design given in Fig. 19 should give satisfaction. Although the sketches show a hot water system, the same type of building would be quite suitable for single unit brooders, either lamp heated, electric, or sawdust burning.

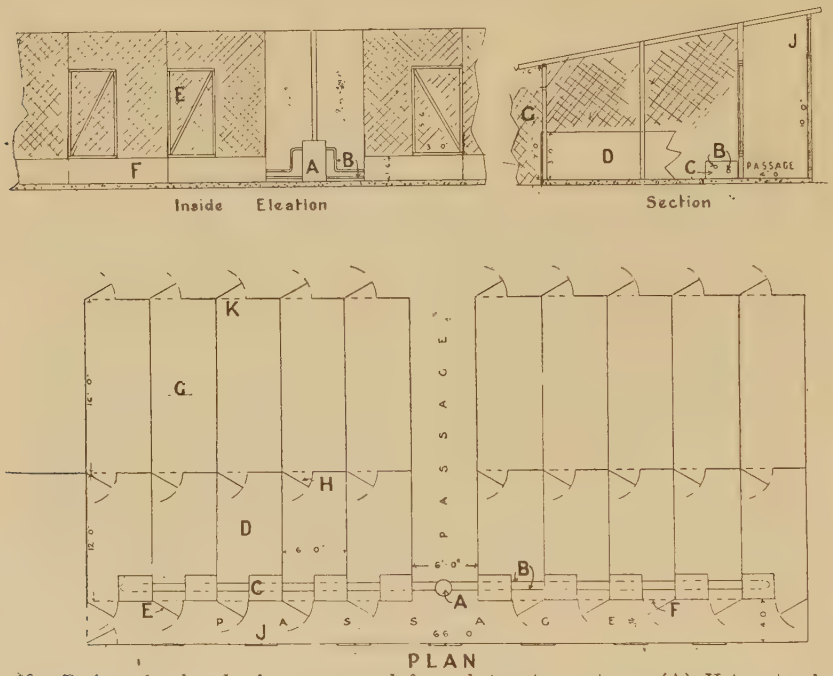


Fig. 19.—Design of a brooder house arranged for a hot water system. (A) Hot water boiler. (B) Flow and return pipes. (C) Box type brooder covering pipes. (D) Inside runs. (E) Wire gates swinging into passage. (F) Asbestos sheeting 1ft. 6in. high. (G) Outside runs. (H) Gates leading to outside runs. (J) Louvre type windows. (K) Gates to outside runs.

The front and both ends of the brooder house are fully enclosed with flat asbestos sheets or other building material, but the back is only enclosed by asbestos to a height of 3ft. above floor level and above that it is wire netted. The gates "H" in the back of the shed, which allow the chickens access to the outside runs "G" open inwards so that chicks coming into the brooder house from the outside cannot become imprisoned behind a gate. The gates are 3ft. wide and the lower half of the gate is covered with flat asbestos. To prevent ground draughts the partitions between the sections in the brooder house are similar to the back of the house, that is, 3ft. of flat asbestos enclosing the lower portion "D" and wire netting above, as shown in the section of Fig. 19.

The series of windows "J" near the top of the front wall ensure good ventilation as well as allowing sunlight to reach the chickens.

The usual arrangement in a hot water pipe type of brooder is for the boiler to be situated at one end of the brooder house, with the result that the portion of the pipe system "B" farthest away from the boiler is always much cooler than the pipes near the boiler. By placing the boiler "A" in the centre of the brooder house, a more even temperature can be maintained throughout the system.

Each section of the brooder house is 12ft. by 6ft. which gives ample room to brood 100 chickens until they are old enough to do without heat and can be removed to the rearing pens. The wire netting gates "E" leading into each section are 5ft. 6ins. x 3ft. and swing outward into the passage. The bottom of the gate is 1ft. 6ins. above the floor level and below this is filled in with flat asbestos "F" which forms the back of the brooder and prevents ground draughts. The building illustrated is 66ft. long x 16ft. wide, is 10ft. in height in the front and 7ft. at the back. The passage along the back of the brooders is 4ft. wide and easy access to the boiler is by a 6ft. wide passage from the front of the house or from the passage in the house. The floor is concrete raised at least 4ins. above ground level to ensure dry conditions.

The outside runs "G" are each 16ft. x 6ft. and should be overhead netted. Gates "K" 3ft. wide and swinging outwards, give entry to the runs.

APPLIANCES FOR THE LAYING FLOCK.

Perching was discussed in the September, 1947 issue of the Journal of the Department of Agriculture, and the information has been printed in leaflet No. 904 which is available at the Department of Agriculture, Perth.

Dry feed hoppers are in use on most poultry farms and there are numerous sizes and types, many of which give satisfaction. Fig. 20 illustrates a dry feeder for adult birds in which the container is a 44 gallon drum. As these

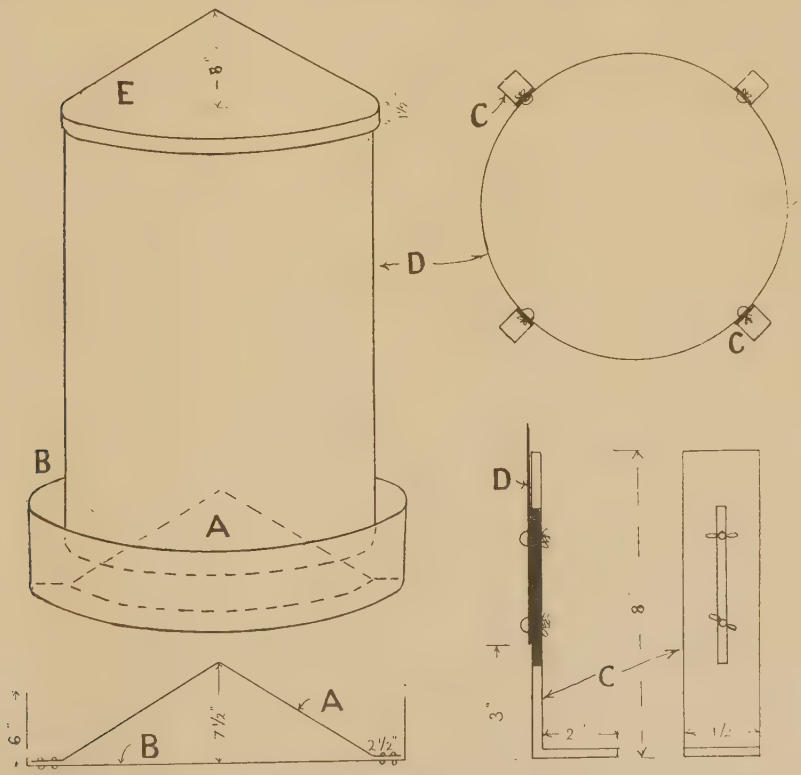


Fig. 20.—Dry feeder made from a 44 gallon drum. (A) Cone distributor. (B) Feeding tray rivetted to cone. (C) Iron legs bolted to drum. (D) 44 gallon drum. (E) Conical shaped lid.

drums vary considerably in diameter it is necessary to make new measurements for each drum. The sketches are practically self-explanatory but there are one or two points that should be mentioned. It is usual to rivet the distributing cone "A" to the bottom part of the tray "B" so that the legs "C" supporting the drum are resting on a double thickness of flat iron.

Four legs are used to support the drum at a height of about 3ins. above the bottom of the tray. The legs are attached to the drum by gutter bolts and wing nuts as shown in sketch, and can be adjusted to the required height.

Drinking Water for the birds should be provided in such a manner that contamination is impossible. The usual form of watering is a trough of some description in which the water is controlled by a ball tap. This method has proved successful provided the trough was covered to prevent contamination. Fig. 21 shows the type of trough that has been recommended by this Department and is included in the sketches of the semi-intensive laying shed. The trough is made of plain galvanised iron, is approximately 6ft. long, 4ins. deep and 6ins. wide at the top. The supply pipe and ball tap are at one end and a draining plug is inserted in the bottom of the other end. It is essential to cover the trough as a protection against the sun especially during the summer months.

A brass nipple watering system has been in use for some years in Queensland and has proved most successful. It would appear to be ideal for the prevention of water contamination, and is most economical in water consumption as it

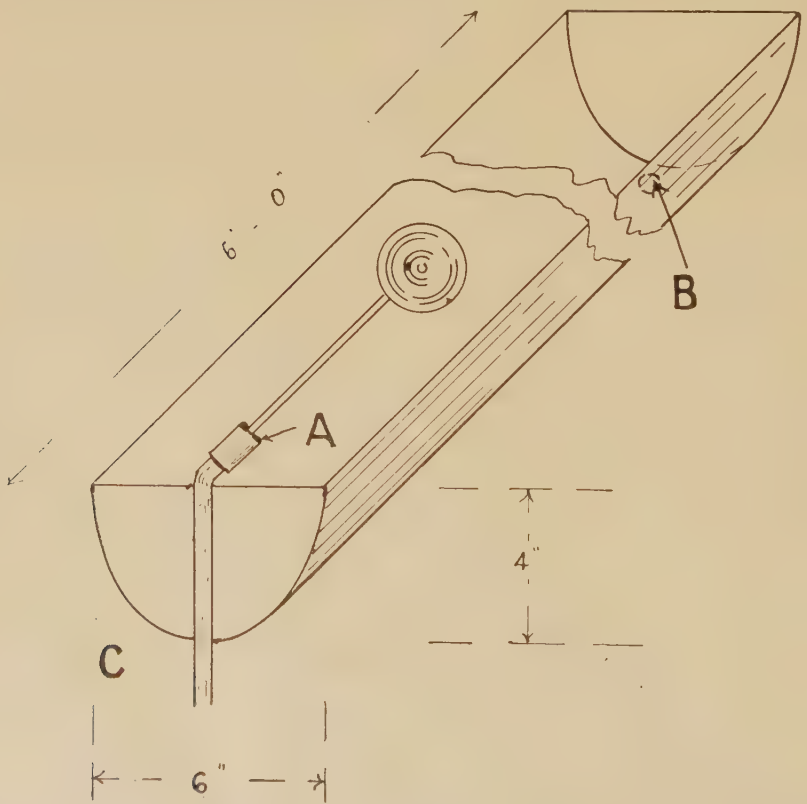


Fig. 21.—Common type of water trough. (A) Ball tap. (B) Draining plug. (C) Water supply pipe.

eliminates the waste which is inevitable with a trough system. Fig. 22 illustrates the type of nipple in use in Queensland; the casting "C" is approximately ¾in. in length, and is threaded for ¼in. at one end to screw into the water pipe. The valve stem "E" fits loosely in a hole bored through the centre of the casting and the valve seats at the threaded end. A bird drinking the small droplet of water "F" hanging to the end of the valve stem lifts the valve

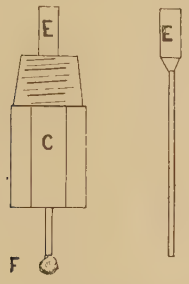


Fig. 22.—Brass nipple. (C) Octagonal casting ⅜in. by ⅜in. threaded at one end. (E) Valve and stem. (F) Droplet of water.

sufficiently to release another drop of water. A ½in. pipe is drilled and tapped to take the nipples, which are spaced about 1ft. 6ins. apart. As this method of watering requires low pressure it is usual to break down the pressure by running the water into a cistern, controlled by a ball tap, before it reaches the nipples. The pipe carrying the nipples should be about 1ft. 6ins. above ground level.

When a piped water supply is not available, it is possible to use the nipple system by connecting the pipe carrying the nipples to a water container which would require filling periodically. Fig. 23 shows the suggested arrangement using a 44 gallon drum as the container.

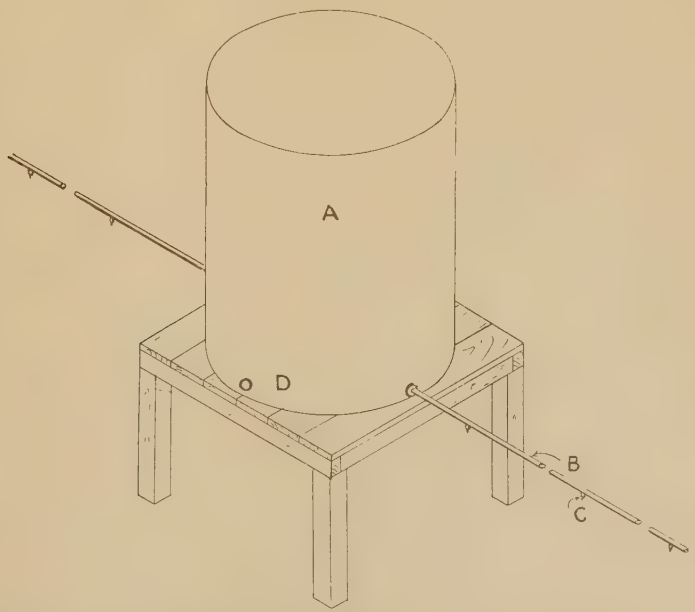


Fig. 23.—Nipple watering system. (A) A cistern or drum water container. (B) ½in. pipe 1in. above the bottom of the container. (C) Nipples. (D) Draining plug.

Finally, the object of this article is to improve the standard of the buildings on a poultry farm, so that, over a period of years, the poultry farmer will build up a valuable asset which will deteriorate slowly, and will give him a pride in his work, and make that work easier.

ACKNOWLEDGMENT.

Grateful acknowledgment is given to the Chief Draftsman, Lands and Surveys Department for completing the designs from drawings submitted by the authors.

FRUIT AND VEGETABLE SHIPMENTS TO SINGAPORE

A Report by H. R. POWELL, Superintendent of Horticulture.

(*Continued from Vol. XXV, No. 2, Page 185.*)

APPLES.

Two hundred bushels of Granny Smith apples were loaded at Fremantle for Singapore as non-refrigerated cargo on the M.V. "Charon" on the 5th November, 1947. They were stowed in two stacks of 100 cases each, one being on deck and the other in the upper tween cattle deck. Each stack consisted of similar fruit and the same range of sizes.

Although it was known that it was far too late in the season to export apples as non-refrigerated cargo, the superintendent of the State Committee of the Apple and Pear Marketing Board, Mr. R. M. Carter, shipped the fruit for experimental purposes associated with my visit. This practical co-operation was very much appreciated.

Weather conditions were observed during the voyage and data collected covering temperature and humidities under both tween deck and deck conditions. In addition pulp temperatures were recorded daily. A full report will be made on this aspect of the investigation.

It can be mentioned that pulp temperatures rose steadily. The highest temperature recorded was 95° in the top layer of apples in the case immediately under the tarpaulin covering the stack. Otherwise there was little difference between the temperatures of the fruit on deck and in the tween deck which ranged from 80°-85° towards the end of the voyage.

The first signs of "core flush" were noticed six days after leaving Fremantle and it developed steadily throughout the voyage. Slight signs of "scald" associated with sunburn injury were noticed on the second day and it also progressively developed during the voyage.

Unfortunately, owing to the wet weather experienced during the last two days, it was not possible to make a thorough inspection of the deck fruit prior

to berthing at Singapore as had been arranged with the ships' officers. However, early in the morning of 13th November when the vessel berthed at Singapore, a quick examination was made.

The chief defects noticed developing during the voyage were as follows:—

(a) Scald—associated chiefly with sunburn injury.

(b) Yellowing.

(c) Core Flush.

The "Charon" arrived in Singapore on the morning of the 13th November and through the co-operation of the Australian Trade Commissioner, Mr. J. Payne and Mr. R. E. Rew, representative of a West Australian fruit exporting firm, contacts were made with importers and dealers.

Mr. Rew's Chinese assistant, Douglas Chee Kim Khoon, was of very great assistance as a translater in the discussions with the Chinese dealers. Many of them do not speak English and much information would not have been obtained but for this help.

During the course of my stay in Singapore, which extended to the 5th December when I returned on the M.V. "Gorgon," I was able to see the discharge of 19,931 cases of Western Australian apples and approximately 3,000 cases of Victorian apples ex the "Orestes" which arrived on the 29th November. I was also able to see small consignments of Canadian and American apples.

Western Australian Apples.

M. V. "Charon"—It was mentioned earlier that the chief defects with the apples on the "Charon" were "scald," "yellowing" and "core flush."

Subsequent visits to the dealers' premises confirmed this and most of the fruit, originally green in colour, was found to be yellowed, particularly the 2¾'s (YYY). The 2½'s were mostly two-thirds yellow GYY, and the 2¼'s were mostly half to two-thirds yellow, GY to GYY. Bruising was very prevalent and there is no doubt that this condition is very much disliked by dealers. Dealers stated that during recent months Granny Smiths had been arriving much too yellow in colour. "Core Flush" was also very much in evidence.

"Orestes"—Approximately 22,500 cases of apples in refrigerated stowage were discharged from the "Orestes" of which 19,931 were loaded at Fremantle and the balance at Melbourne. The Western Australian fruit was all Granny Smiths and the Victorian consisted of Granny Smiths, Dunns, Democrats and Yates.

The vessel arrived on the morning of Saturday the 29th November and unloading commenced at 4.0 p.m. that day and continued over the next seven days. The long time taken to discharge the cargo was due mainly to hold-ups associated with extremely wet weather, but there was some delay caused by the reluctance on the part of some dealers in picking up their fruit.

Defects Noted.

(a) *Yellowing*—Chinese buyers prefer apples that are green and hard. They are particularly fond of Granny Smiths and the preference for the green colour applies not only to apples but to grapes as well. I endeavoured to ascertain the reason why this colour is preferred and the nearest approach I could get was that "green" is a symbol of "prime condition."

The "Charon" consignment, although it sold reasonably well, would not have been shipped so late in the season as deck cargo but for my visit. The original colour ex cool store was green but during the voyage of approximately 12 days the fruit rapidly yellowed. The larger sizes ex the M.V. "Orestes" maintained their colour fairly well, but it was evident that yellow colour was rapidly developing.

(b) *Scald*—Unfortunately, some time prior to my visit two cargoes carried by the "Asphalion" and "Gorgon" had arrived in a deteriorated condition owing to "scald." The fruit sent ex the "Charon" and "Orestes" was not

Granny Smith 2½in. apple seen at Singapore affected with "scald" in association with sunburn injury.

(Photo.: H. R. Powell.)

generally very badly affected although in some individual instances this disorder was very pronounced. It was almost invariably associated with sunburning, even slight sunburn injury. The dark colour rapidly developed and perhaps owing to climatic conditions, became almost an ebony black. Members of the

Fruit Importers Association at a meeting to which I was invited, were particularly critical of the amount of "scald" in the fruit carried by the "Gorgon" the previous September. The fruit in question came mainly from the Donnybrook district. Criticism was expressed that owing to the operation of the Apple and Pear Marketing Board, no selection of particular growers' supplies could be obtained, and the fruit lacked its pre-war uniform quality.

(c) *Pressure Marks*—A considerable quantity of Granny Smiths seen were badly affected with bruises and pressure marks. This fault is very unpopular with the Chinese and they stated emphatically that they would prefer the apples to be packed not so tightly and with no bulge. Unfortunately in Western Australia the harvesting season is normally associated with rain and the fruit becomes very susceptible to bruising during harvesting operations and to pressure marks when packed, unless very carefully handled.

(d) *Core Flush*—"Core bush" is a disorder of overmaturity and would not, I think, be normally seen in Singapore. As pointed out previously the late deck shipment made on the "Charon" rapidly deteriorated. The larger sizes were most affected but the 2¼'s in some instances, were equally as bad. An affected apple although appearing healthy outwardly, shows when cut, a dark discolouration of the tissue in the core region.

(e) *Red Flush*—During cool moist growing seasons, particularly in the Great Southern districts, a pronounced "red flush" is common on yellow and green varieties notably Dunns, Cleopatras and Granny Smiths.

In some seasons the "flush" becomes an intense red colour. With late stored fruit, however, the colour fades to a dirty brown. This condition was noticed on many occasions in Singapore and marred the appearance of the fruit.

(f) *Wrapping Paper*—In some instances white wrapping paper was used instead of the green paper normally used. This was very much disliked by the dealers and they stated emphatically that green paper should always be used. As mentioned earlier the colour itself has a definite connection in the minds of Chinese buyers with good keeping quality.

It was very apparent that the defects of the previous shipments, had made buyers extremely nervous. Although they were aware that the Granny Smiths on the "Orestes" would be a refrigerated cargo, great uneasiness was shown by dealers as they feared the quality of the fruit would be marred by "scald."

The lesson to be learned, is that one bad shipment can affect subsequent good shipments to a considerable degree, by destroying the confidence of buyers.

On one dealer's premises, with an audience of dissatisfied spectators, I was shown a number of cases of Western Australian 2¾ Granny Smith apples brought by the previous "Asphalion" that had been shipped non-refrigerated and subsequently cool stored, probably a week or so later after discharge. The condition of the fruit was very bad. Approximately 50 per cent. of the contents had broken down due to "rots" and the balance was yellowed and badly bruised. There was no doubt that the fruit had been cool-stored in an effort to salvage higher prices and was in no condition to be stored. It was impossible to appease them, but the opportunity was taken to explain that late shipments should be made in refrigerated stowage.

Subsequent Improvements.

(a) *Non-refrigerated Shipments*—It was stated that September and October shipments of large 2¾ Granny Smiths had arrived in a deteriorated condition —it was certainly true with regard to the "Charon" shipment in November. Most importers interviewed, said they would prefer this size to be shipped in refrigerated space after the end of July. This is understandable as the value of the variety on the Singapore market lies in its green colour and ability to retain this condition for some considerable time.

The smaller sizes particularly the 2¼'s, would probably hold their condition to the end of September and the 2½'s to the end of August but it would be wise if this market is to be safeguarded, to use refrigerated space for all sizes from the end of July onwards.

It must be emphasised, however, that since the war non-refrigerated shipments have been made late in the season only because adequate refrigerated space has not been available. Unfortunately when losses are made, buyers are slow to forget and tend to obtain their requirements from other sources.

(b) *Wrapping Paper*—Green oil wraps should be used wherever possible. It is realised that last year shortages of the green paper were responsible for the white paper being used. As mentioned previously good keeping qualities of the fruit is associated, in the minds of Chinese importers, with the green colour of the paper.

(c) *Packing*—In order to reduce the extent of bruising and other defects, it is suggested that particularly when Acquisition ceases and growers seek to specialise on export orders, as some did previously, it would perhaps be advisable to cool store apples for this trade loose in boxes after they have been sized and graded; the fruit to be packed when export orders are received. This would enable defective fruit to be culled out before packing. In addition there would be a tendency for the fruit to toughen up and become not so susceptible to pressure marks when packed. This is common practice in the Eastern States and it was noticable that the Victorian Granny Smiths ex the "Orestes" were firm and free from pressure marks and bruises.

Although packing should be firm it should not be tight and pronounced bulges should be avoided.

(d) *Scald*—Apples affected with sunburn should not be included in packs for this market, particularly from the end of June onwards. Scalding is very prevalent during certain seasons and is often associated with sunburn injuries. As mentioned previously, the prevalence of this disorder in one particular shipment caused a great deal of nervousness amongst buyers and affected adversely the sales of subsequent shipments.

(e) *Sizes*—2½" Granny Smiths are preferred. 2¾'s are not so popular because they yellow too quickly and show up bruise and pressure marks more so than do the smaller sizes. Small apples, 2¼'s, did not appear to be generally liked but they could be sent with advantage later in the season when refrigerated space is not available for the larger sizes.

(f) *Cleopatras*—There is a limited market in Singapore for Cleopatras but dealers insisted that they should be hard and green in colour on arrival. A suitable shipping date would be the end of February.

(g) *Labels*—Very few of the consignments ex the "Orestes" were labelled and this omission caused considerable criticism. Dealers considered that all quality fruit should be labelled and this has been customary with other exporting countries. They were of the opinion that when labels were not used, it was on account of the exporter considering the consignment in question was not good enough to label. The Chinese are susceptible to appearances and good presentation including labelling, is essential on this market.

American grape and apple boxes seen were all labeled. Many of them bore striking designs that could not fail to instil confidence in the minds of buyers.

The actual use of colours is important for instance black and white are not popular with the Chinese as they are mourning colours; red and yellow are favoured in this order, but as yellow is the royal colour it should not be over-done; green is the most popular colour.

When labels are used the greatest care must be exercised in ensuring that they are properly attached to the cases. There were a few instances of consignments of oranges from the Eastern States which arrived in an unsightly condition owing to the labels becoming loose or badly torn. The labels on the American grape cases were so firmly attached that it was difficult to secure even one or two as specimens to bring back.

(h) *Cases*—All the Western Australian fruit seen was packed in redwood dump cases doubly wired and they arrived in good order. The quality of the cases was fairly good but they were certainly not up to pre-war standards. These cases are popular in Singapore and they are handled very carefully on account of their resale value. There was no suggestion that the standard apple box should be used.

(i) *Stencilling*—Although mostly very good there were instances of indistinct stencilling. The uniform system adopted gave the whole consignment the impression it had been handled through one packing centre. No matter how good the stencilling is done, however, it will always be a poor substitute for labels.

(j) *Branding*—In some instances the shipping brands were carelessly applied and misleading. Some confusion was caused by two consignments, prepared apparently by the same agent. The shipping brands were TH and T.H.S. A faint S alongside the former brand, indicating that the same stencil had been used, caused the two consignments to become mixed and resulted in a lot of unnecessary trouble to the two importers concerned.

Normally the fruit is collected from the ship's slings by coolies employed by the importer, and it is thus very necessary for the shipping brands to be clear and distinct.

Victorian Apples.

Approximately 3,000 cases were discharged from the M.V. "Orestes" as refrigerated cargo. The varieties were Granny Smiths, Yates Dunns and Democrats.

Seen during discharge the fruit seemed to be in good condition and it was noticed that a system of grading to 1/8ths had been adopted.

A quantity of Granny Smiths and Yates were seen subsequently on dealers' premises and some Granny Smiths, 3in. size, were a total loss due to "scald" and "breakdown." The balance of the fruit in one case which was 50 per cent.

broken down, was completely marred by severe scalding Another case from the same grower showed 100 per cent. "scald" and 30 per cent. "breakdown;" other cases showed some breakdown but little "scald." The sound fruit was in a very good condition and of excellent quality. It is interesting to point out that even the large sizes were free from bruises and pressure marks. The pulp temperature of the fruit two days after discharge ranged between 70° and 73°.

A number of cases of Yates was seen; the fruit was sound but colour was weak and the line was generally unattractive. An endeavour was made to trace the Dunns without success; it was learnt later that they had been quickly disposed of as Army contract. Some Democrats were seen on a stand in the Orchard Road Market. The quality was excellent and there were only a few broken down fruits in the cases seen. There does not appear to be much demand for red and yellow varieties. The red ones are considered to be too dry.

American and Canadian Apples.

Quantities of American and Canadian apples were seen on one dealer's premises. They were packed in standard boxes made of pine.

(a) *Canadian*—Newtown Pippins—138 Extra "Fancy" from the Keremeos Packing House, Keremeos, British Columbia.

Deep blue crepe lining paper was used, giving a pleasing contrast with the clean white of the boxes. The wrapping paper was printed to the effect that doctors and dentists recommend apples for health and that the fruit should keep in a cool moist atmosphere.

The fruit was green, evenly sized and of good quality. Shipment was made to Hong Kong as refrigerated cargo and as deck cargo from Hong Kong. I understand that the journey from Hong Kong is of approximately six days' duration. It was stated the cost of the fruit was $22 (£3 4s. 0d.) c.i.f.

(b) *American*—White Winter Pearmain—150 "Fancy."

Brand—Dewsweet.

The labels were particularly attractive and were printed on very good quality paper. The fruit was mostly dead green and hard which is wanted on this market. The boxes were stamped by the inspection service to the effect that fruit was of approved quality.

Newtown Pippins—"Fancy" Grade.

Brands—Green Thumb and N.M.B.

The 2¼'s were green but woody in texture and heavily russeted around the stem ends; there was no cracking. The 2¾'s were yellowing and were also badly russeted. Apart from this, however, the fruit was free from blemishes, perfectly sized and attractive looking. The boxes used were standards with tops consisting of four narrow pieces of wood with large spaces between them and were lined with blue paper. These apples were selling in the vicinity of $20 (£2 18s. 0d.) a box, the landed cost being $18 (£2 12s. 0d.).

It was stated that the American shipping season for White Winter Pearmain extends from August to September and for Newtowns, September to November. Normally the American fruit would have the market from August onwards.

Wholesale Prices.

The approximate landed cost of Granny Smiths during this time was as follows:—

	£	s.	d.	
F.o.b.	1	7	6	
Freight (refrigerated) and Insurance ..		8	2	
	1	15	8	($12.20)

	£	s.	d.	
F.o.b.	1	7	6	
Freight (non-refrigerated) and Insurance		6	7	
	1	14	1	($11.70)

(Two and eleven pence is taken as the equivalent of the Malayan dollar.)

Landing charges would be in the region of 30 cents (10½d.) a case, thus sales had to be made in the region of $12 to $12.50 (£1 15s. 0d. to £1 16s. 6d. a case) to cover normal handling expenses. There is no doubt that huge profits were made by dealers in 1946. I was told the peak price that year was $45 (£6 11s. 0d.) a case. According to the same dealer the highest price obtained in 1947 was $24 (£3 10s. 0d.).

Wholesale prices for the inferior fruit ex the "Charon" ranged from $4 (12s.) to $16 (£2 7s. 0d.) a case. Receipts practically cleared all expenses incurred with the shipment.

The discharge of the apples ex the "Orestes" was somewhat protracted. Those who got early deliveries were fortunate in that they got their fruit on the market ahead of competitors and received premium prices from $1 (2s 11d.) to $2 (5s. 10d.) a case. Opening prices were $16 (£2 6s. 8d.) for 2½'s and $13 (£1 18s. 0d.) to $15 (£2 3s. 9d.) for 2¾'s and 2¼'s. The market later settled down from $13 (£1 18s. 0d.) to $14 (£2 0s. 10d.) a case.

It was obvious that dealers were apprehensive with regard to the development of "scald" and there was little tendency to cold store excess requirements in the hope of obtaining higher prices later on.

Wholesale prices for Eastern State apples ranged from $9 (£1 6s. 3d.) to $13 (£1 18s. 0d.) for Granny Smiths, $9 (£1 6s. 3d.) to $10 (£1 9s. 2d.) for Yates and Democrats.

Some dealers complained that the c.i.f. cost was too high. It should be $10 (£1 9s. 2d.) they said, and this price would enable them to make sales ranging from $11.50 (£1 13s. 6d.) to $12 (£1 15s. 0d.) a case. Many of the dealers were despondent at this time, as most imported fruit with the exception of apples was being sold under cost.

Retail Prices.

The retail prices bore little relation to the wholesale prices. A check was made at three representative centres, namely the retail shop of the Singapore Cold Storage in Orchard Road, the Orchard Road Market, mainly patronised by Europeans and wealthier Chinese, and the Native Market in Beach Road.

There are very few retail shops as we know them, the bulk of the fruit being sold through markets, road-side stalls and by hawkers. The quantity of fruit of all types displayed for sale is tremendous.

	Singapore Cold Storage.	Orchard Road	Beach Road
Granny Smiths—W.A.	15c.-20c. ea. (5½d.-7d.)	15c.-20c. ea. (5½d.-7d.)	15c.-20c. ea. (5½d.-7d)
Democrats—Victorian	—	20c. ea. (7d.)	—
Newtowns—U.S.A.	30c. ea. (10½d.)	30c. ea. (10½d.)	30c. ea. (10½d.)

The retail prices show perhaps the market preferences for hard green apples. The American Newtowns compared more than favourably with the late stored Australian apples.

The retailer makes a large profit and appears to prefer restricted sales at high prices to a quick turnover at more moderate prices. The retail price of 5½d.-7d. an apple is equivalent to from £3/4/2 to £4/1/8 for a case of large 2½'s (140's). Comparable wholesale prices probably ranged from £1/18/- to £2/-/10d. a case. The climate is oppressive and is not conducive to the fruit retaining its condition for long, particularly late cold stored apples and some losses due to wastage are unavoidable.

Deteriorated fruit finds a ready sale with hawkers who salvage the sound portions. It was a common sight to see pieces of apples carefully peeled and trimmed being offered for sale to those who could not afford to buy a whole apple.

General.

The main faults encountered with Western Australian Granny Smiths were "yellowing," "scald," and pressure marks. To a large extent these can be obviated by more careful attention by growers when packing. Fruit affected with sunburn injuries should not be cool stored for the Singapore export trade. As far as "yellowing" is concerned, non-refrigerated shipments should not be made after the end of July as far as the larger sizes are concerned; the smaller sizes could perhaps be sent to the end of August as far as the 2½'s are concerned and to the end of September for 2¼'s.

A recent report received covering a non-refrigerated shipment made during July 1948 revealed that the 2¾'s were yellowed and affected wholesale prices by approximately $2. (5/10) a case. It is realised that shippers have had very little say in the past few years and have had to avail themselves of what shipping space is offering.

South Africa has made a determined bid for the citrus market and is meeting with considerable success. As this country is also a large apple growing country, it is possible that strong competition will be met in the future with apples as well.

THE ARGENTINE ANT.

(*Iridomyrmex humilis.* Mayr.)

By C. F. H. Jenkins, Government Entomologist.

INTRODUCTION.

THE native home of the Argentine ant, as its name implies, is believed to be the Argentine Republic. It is recorded, however, from other South American countries, and has been introduced into the United States of America, where it is reported to be still spreading. It is now established in many countries of the world and on the island of Madeira is said to have been so successful as to have supplanted completely all the native ants on the island. It was known in South Africa as long ago as 1908, and it still remains a serious pest in that country.

The first record of the ant in Australia came from Victoria in September, 1939. It was not long however, before the pest was located in Western Australia, the original specimens being sent to the Department of Agriculture for identification by residents of Albany in April, 1941.

Regulations were immediately gazetted quarantining the affected area, but unfortunately later inspections made in metropolitan districts showed that the ant had gained a firmer hold than was first suspected. It has now been necessary to prevent the sending, from within a five-mile radius of the Perth Town Hall to other parts of the State, plants in pots or packed in soil except with a permit from the Department of Agriculture.

GENERAL DESCRIPTION.

Being social creatures, Argentine ant colonies contain queens, males, and workers. It is the workers which are most commonly seen, and whose presence cause the actual trouble. In size they resemble very closely a number of other

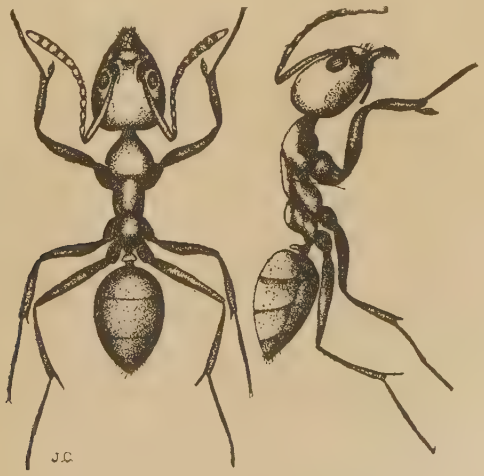


Fig. I.—Argentine Ant Workers.
(After Clark.)

common house ants measuring about 1/8 of an inch in length. They are a uniform honey brown in colour, and do not give off the formic acid smell so characteristic of most ants when crushed. This is not an infallible means of identification, however, as other local ants are also characterised by this lack of odour.

Fig. II.—Small colony of Argentine Ants.

(From U.S. Dept. Agric.)

The winged male ants are seldom seen, but are somewhat larger than the workers. The virgin queens are winged and are also larger than the workers. When saddled with the responsibility of maintaining the population numbers of a colony they grow still more due to the increase in the size of the egg-distended abdomen and shed their wings.

LIFE HISTORY AND HABITS.

The size of ant colonies may vary considerably, containing from dozens to thousands of individuals, and the number of queens present may vary from one to a hundred.

The full details of the life history have not been worked out locally, but in America the ant has been exhaustively studied. It has been found that after the appearance of winged males and females in the nest a nuptial flight may or may not follow. In either case the females, after becoming fertile, lose their wings and commence egg laying. They may lay 30 or more eggs a day, and live for several years. Most of the eggs develop into worker ants, but at certain seasons males and queens also appear. Like most ants the individuals of this species are great foragers. Strong trails of the insects will travel considerable distances in search of food, invade houses, or swarm over trees and other objects where suitable attractions are to be found. So strong is their colonising ability that other ant species often find it difficult or impossible to survive where the Argentine ant is well established.

MEANS OF DISPERSAL.

The fact that nuptial flights are not the regular habit of this ant, and that in some countries the females have not been seen to fly at all means that the natural dispersal of the pest is very slow. It is mainly by artificial means that the insects have been spread about the world, and here again is an important point to note. In order for the species to establish itself a whole colony containing at least one fertile queen must be transported. It is not enough to carry large numbers of workers to a fresh district. These may survive for a long time, but they would not be able to reproduce.

It will now be clear why strict quarantine regulations are passed preventing the removal of plants in pots, and soil from infested areas, for by such means a whole colony may easily be carried. It is a common habit of the ant to establish itself in seed boxes or pot plants or even debris and leaves associated with plants. It is by no means only in plants, however, that the insects can be spread, for colonies may make their way into old packing cases, manure heaps and similar refuges, but infested nursery stocks and stable manure have proved to be the most dangerous means of dispersal in this State.

PRESENT DISTRIBUTION IN WESTERN AUSTRALIA.

Although various reports have been received from time to time concerning the presence of the ant in widely separated country areas, there is no evidence to suggest that the pest is widespread in this State. It is firmly established at Albany and in Perth, and isolated outbreaks have been recorded at Wanneroo, Kalamunda, and Bunbury. Investigation has shown all other reports to be groundless.

Fig III.—Orange tree after exposure to Argentine Ants for three seasons.
(From U.S. Dept. Agric.)

TYPE OF DAMAGE CAUSED.

Besides being a domestic menace the ant is a serious orchard pest and it is as such that it is mainly feared.

As an Orchard Pest.

Injury is not actually caused by the ant itself but the creatures are greatly attracted by the honey-dew given off by scale insects, aphides, and mealy bugs, and so heavily infest trees carrying these pests. The swarms of ants running hither and thither over the twigs and branches prevent ladybirds, parasitic wasps, and other useful insects from exerting their normal control, and furthermore the actual attention from the ants causes more honey-dew than usual to be excreted. Consequently fruit and foliage are soon covered with the dirty sooty mould fungus associated with insect honey-dew, and the scale or aphis population rapidly rises with consequent detrimental effects upon the trees.

Fortunately, the main orchard districts in Western Australia are still free of the ant but in California and South Africa the control of such pests as mealy bugs and red scale is largely dependent upon whether the Argentine ant can first be subjugated.

As a Household Pest.

The Argentine ant is practically omnivorous in its taste attacking sweets such as sugar or honey and cooked meat or bones with almost equal readiness. Its persistence is unequalled by any other species, and at times houses have even been vacated on account of the persecution of this insect.

CONTROL MEASURES.

In the words of two Californian workers (Eckert & Mallis 1941), "The Argentine ant can be reduced or exterminated only through continuous and unrelenting efforts that match the ants in persistence." All attempts to combat the pest must be co-operative and sustained. Especially does this apply to suburban and city infestations, where the efforts of some householders may be largely nullified by the apathy or carelessness of neighbours.

Factors Influencing Control.

The first essential in controlling ants as a household pest is to see that no crumbs or particles of food are left about to attract the insects. Despite all efforts however, more direct action is often necessary and circumstances must determine just what methods may be used most effectively. The need for general cleanliness out of doors is also very important as bones and food scraps in the yard are very attractive to the ants. Old litter such as grass and leaves is a favourite harbourage especially in the wintertime and should be periodically burned or treated for ant control. Clean cultivation in shrubberies and orchards also greatly facilitates ant control. In clean cultivated orchards there is little ant movement between trees, but in overgrown weedy plots it is often difficult to find a space which has not been colonized.

Weather and Seasonal Conditions.

Temperature greatly influences ant activity, for extremes of heat and cold are unfavourable to the creatures. Under Californian conditions baiting has proved most effective in the spring and autumn when temperatures are moderate

Fig. IV.—Characteristic trails of the Argentine Ant in a tree trunk.
(From U.S. Dept. Agric.)

and natural food such as honey-dew less plentiful. There is evidence to suggest similar influences in this State and in addition the rate of reproduction is so rapid in mid-summer that in spite of a heavy death roll the numbers often appear unaffected.

Fumigation.

When it is possible to find the ants' nests by tracing along the trail of workers, the entire colony may be destroyed by pouring into the hole a couple of tablespoonsful of carbon bisulphide. Where several holes are present all should be treated and the openings blocked with moist earth to prevent the escape of the heavy gas generated. (Carbon bisulphide is explosive and inflammable, and so should be used with care.)

A liberal sprinkling of calcium cyanide dust into the hole if the entrance is subsequently blocked will also be found effective.

Poison Dusts.

Many types of powders have been used against ants with varying degrees of success. D.D.T. mixtures varying from 2 per cent. to 10 per cent. have been used with good effect, the stronger concentrations giving the best results. Other powders used are sodium fluoride, Paris green, arsenical sheep dip and sodium fluosilicate. The powders should be sprinkled about in places frequented by the ants and liberally sprinkled into and around the nest entrances. The efficiency of powders depends upon their being finely ground and dry, for the tiny particles cling to the legs and body of the workers and are eaten in subsequent cleaning and grooming operations as well as being fed to the queen and other occupants of the nest. Ant eradication by this means is a long process but it is only by patience and persistent treatment that the pest usually is overcome.

Baiting Technique.

The control of ants by the use of poison baits is seldom immediate and an obvious reduction in numbers may not be apparent for days or even weeks. Furthermore, no dead ants will be seen around the tins (excepting those accidentally drowned) as the poison is slow acting and allows the workers to return to their nests, where some of the poison will be fed to other ants including the queens. It is the destruction of the queens that is essential for the eradication of a colony, hence the spasmodic spraying of worker trails or the use of boiling water while alleviating the immediate position has little effect upon the general situation.

Unfortunately, ants are very sensitive indeed to poisons and many baits are taken for a short time and then entirely ignored. On this account it is quite impossible to prescribe a universal ant bait. If ants do not visit the tins, the location of the containers should be changed, but if ants visit the tins in gradually decreasing numbers then control is being effected.

Bait tins or waxed paper cups (such as ice-cream buckets) with lids and of about 3½ oz. capacity should be used. The containers should be distributed every few feet particularly near the foundations of the house where ant trails are found. No trail should go unbaited and a concentrated drive carefully planned will give much better and more lasting results than desultory baiting every time the ant nuisance makes some action imperative.

Often the ants will make a shallow nest under the actual bait container; if this occurs the tin should be moved and the nest treated preferably with D.D.T. but otherwise with kerosene, boiling water or other contact insecticides.

Bait tins should be kept clean and fresh, as crystallised syrup is not attractive to the ants. Containers should also be free from foreign material or odours before being filled, otherwise they may repel ants coming to the bait. On this account tins should be freshened up and, if necessary, cleaned about once a week.

The accompanying illustration shows the suggested distribution of bait tins on a suburban allotment.

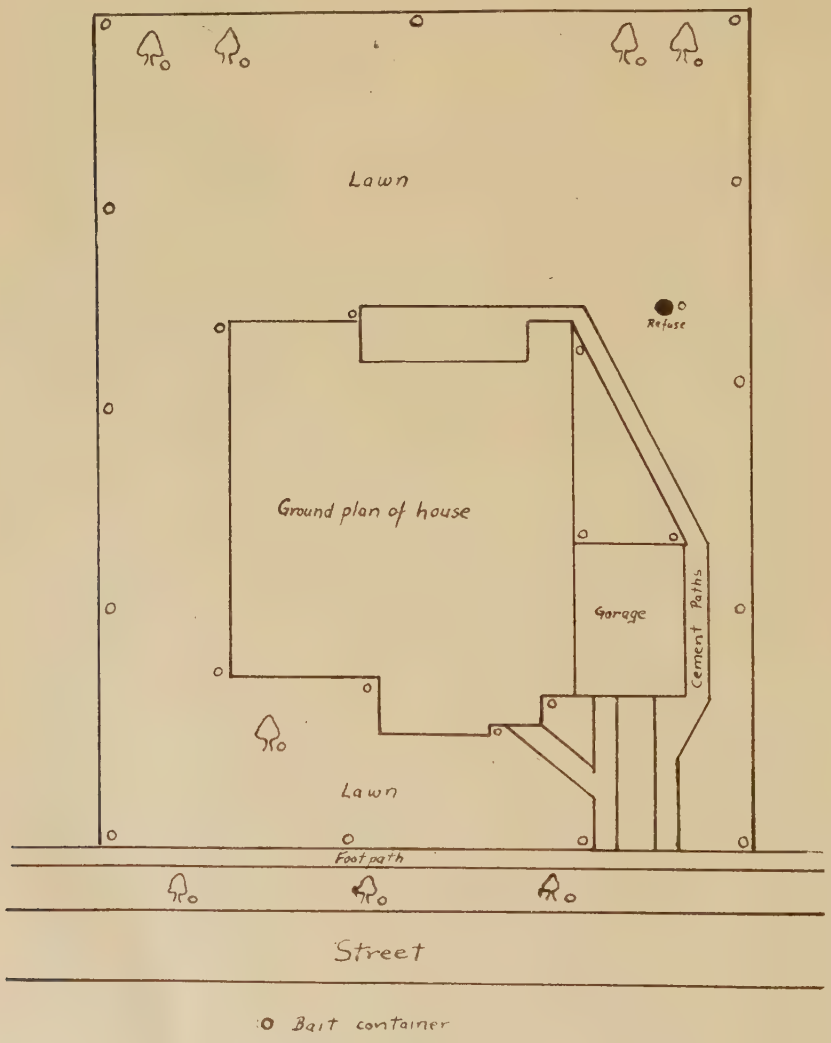


Fig. V.—Diagram of residential block showing distribution of bait containers.

Argentine Ant Baits.

A formula, known as the U.S. Government Formula, which has been satisfactorily used, against the Argentine ant in many countries as well as locally is prepared as follows:—Sugar, 1 lb., tartaric acid, crystallised, 10.3 grains; benzoate of soda, 14.6 grains; sodium arsenite (chemically pure), 26 grains; water, 5/6th pint; honey, 2⅓ oz.

The water should be warmed in a clean vessel over a low fire. When it is tepid, the tartaric acid, benzoate of soda, and the sugar (slowly) should be added. The mixture must be stirred constantly to prevent burning. The depth of the liquid in the vessel should be measured with a stick. Then bring the mixture slowly to the boil and allow to simmer for 30 to 40 minutes. Remove from the stove and add water to the original depth on the measuring stick to make up for evaporation. The honey should then be stirred in before the mixture cools and the sodium arsenite, which has been dissolved in 1.8 fluid oz. of hot water and partially cooled, poured into the syrup.

The foregoing preparation is on the local market as a proprietary line, and is sold under the name of "Anti Ant" (liquid).

By substituting an equal amount of aromatic honey for the sugar in the previous formula, the time required for boiling may be reduced and the tartaric acid omitted. The resulting formula, known as "The Californian Argentine Ant Syrup," is as follows:—

Honey (any aromatic kind)	18⅓ ozs.
Benzoate of soda	14.6 grains
Water	1 pint
Sodium arsenite	26 grains

The mixtures need be boiled only for a few minutes to ensure a uniform mixture and to kill yeast and mould spores.

Other Formulae.

(1) 1½ lb. sugar or honey.
2 pints water.
31 grains arsenite of soda (equal to a moderately heaped penny).
Dissolve the sugar in warm water, then add arsenite of soda, stirring well.

(2) For meat and fat-eating ants the following bait may be tried:—
Fat, 1½ breakfast cups.
Arsenite of soda, 5 grains (moderately heaped threepenny bit).

Warm the fat and stir in the poison. Bacon rind with a little poison rubbed into the fat may also be tried. (The danger to animals and children of such baits should be remembered.)

(3) Paris green—1 oz.
Brown sugar—1 lb.

Mix thoroughly and place small quantities under boards or stones where ants occur. Sprinkled through infested lawns, it has also been found effective.

Bait Containers.

Syrup baits are best used in closed containers in such a way that the ants can enter but so that the contents are protected from dogs, children, etc. The

bait tins should be half filled with syrup and a small piece of sponge, wood wool or other absorbent material may be placed inside to serve as a foothold for feeding ants.

Types of containers which have been used successfully.

Fig. VI.—Bait containers—ice-cream bucket, tobacco tin, and screw top wax carton.

D.D.T. Spraying.

The use of D.D.T. dusts has already been referred to but the most rapid and spectacular results in Argentine ant control have been obtained with D.D.T. sprays. There are various types on the market, some being oil or kerosene solutions, and others in forms suitable for dilution with water. For general purposes the latter are recommended as they are cheaper than oil solutions to use and less likely to cause injury to plant foliage. There is also some evidence to suggest that the residues left by water mixtures, on certain types of surfaces at least, are more effective than those from oil solutions even though comparable concentrations of D.D.T. are contained in both mixtures.

D.D.T. spraying cannot be regarded as a cheap method of Argentine ant control, but a carefully applied spray treatment may so reduce the numbers that results will far exceed those obtained by spasmodic outbursts of activity followed by long intervals of neglect. Such methods are in the long run both expensive and ineffective.

Spraying Equipment.—For satisfactory treatment out of doors, something more than a hand atomizer is required. Stirrup pumps such as those used in A.R.P. exercises during the last war are quite satisfactory, and are useful for general garden spraying. Knapsack sprays are also satisfactory, but more elaborate and expensive than the stirrup or bucket pump.

The quantity of spray required will, of course, vary with the size of the allotment and the degree of infestation. In the case of a badly infested quarter acre block, the treatment of fences, shrubs, building foundations and paths may require 20 gallons or more of 2 per cent. D.D.T. mixture for the initial treatment. A single treatment of this nature will be much more effective than a series of half-hearted attacks and in the long run will prove to be the most economical.

For Household Control—Outdoor Treatments.—Where a premises is badly infested a general spray treatment is recommended.

The foundations of all buildings up to a height of about 12 inches should be sprayed. The edges of concrete paths and garden borders should be treated as well as the fence line and any other areas where nests are present and where the ants are particularly active. Fruit trees and shrubs should be trimmed so as not to drag on the ground, and the butts and main branches should be sprayed. If any limbs touch the fence or the house these may provide a bridge by which ants can cross treated areas. Backyard vines are particularly troublesome in this direction. The garbage tin and its surroundings should also receive special attention.

The efficiency of D.D.T. sprays depends not upon the immediate knockdown from the spray, but upon the fact that the residue remains toxic to ants walking over treated surfaces days and weeks later. The period of effectiveness of a single treatment depends upon the concentration of D.D.T. used, the type of surface treated and the extent to which weathering or other agencies may be involved.

For outdoor use a 2 per cent. water mixture is recommended, although weaker strengths will give some degree of control. Special attention should be given to windows, doors, ventilators, water pipes and other obvious channels by which ants may normally enter a house.

Once the population has been reduced by a general spray treatment, it should be possible by "spot" spraying and continued baiting to keep the pest well under control. Spraying alone has been shown to finally eradicate a colony for, of course, if every worker leaving the nest is killed by the surrounding spray residue, the other occupants of the nest must either die of starvation or emerge themselves only to meet a similar fate to the earlier foragers.

Indoor Treatments.—It is sometimes reported that following general outdoor spraying eruptions indoors may be more frequent for a short time.

Where it is necessary to deal with ants that have actually gained a foothold indoors, immediate relief can usually be obtained by spraying with any of the proprietary kerosene fly sprays. General spraying indoors with water mixtures of D.D.T. is not always possible as unsightly stains may result. Window ledges, skirting boards, ventilators and similar areas may be painted or sprayed, however, with 3 or 4 per cent. kerosene solutions of D.D.T. Bait tins also can be placed at strategic corners to give ants established under the house a ready supply of food, and so reduce their tendency to forage through every room in the building.

Trap Nests.

The habit of Argentine ants sheltering and nesting (especially during the winter) in accumulation of litter, garden rubbish, etc., has already been referred to. This habit is sometimes exploited by deliberately placing suitable shelters such as small heaps of straw, large flat stones etc., in favoured localities in the hope that ants will nest in or under them after which they can be suitably dealt with either by burning or spraying. Such ant traps may have their uses if carefully watched, but there is always the danger that they will be neglected and so prove a further menace rather than a relief.

Fig. VII.—Spraying main trunks of lemon trees with D.D.T. for control of Argentine Ants.

Orchard Control.

As stated earlier in this article, the Argentine ant can cause considerable damage to fruit trees owing to its habit of tending "ant cows" such as mealy bugs, scale insects and aphids.

Affected trees should be trimmed free of the ground and the butts and main branches should be sprayed with a 2 per cent. D.D.T. water mixture. The treatment must be carefully done and branches must not have contact with the ground through wooden props or similar supports. In one test conducted in a badly infested orchard the apparent failure of one treatment was traced to a wooden prop by means of which the insects had climbed to the upper branches and moved from tree to tree through the interlacing upper leaf canopy.

Actual tests with a 1 per cent. D.D.T. emulsion kept trees ant free for seven weeks and after fourteen weeks only a very light infestation was in evidence.

The necessity for clean cultivation has been stressed previously and particularly is this important around the outer rows of the orchard. Re-infestation will often occur from thick grasslands surrounding the orchard, and special care should be taken to police outer rows once the orchard has been freed of the pest.

Above ground water pipes often serve as pathways for the ants and should be sprayed and kept under strict observation, in addition to spraying if any ant activity is noted on the ground.

The Possibilities of Control and Eradication.

There have been many who have expressed a doubt as to whether Argentine ant control much less eradication is possible. The answer to this viewpoint is contained in the following quotation dealing with Argentine ant control campaigns in the United States of America (Smith 1936).

"Control campaigns were therefore inaugurated through a co-operative arrangement between the State Plant Board and the infested communities, with the assistance of Mr. Barber in directing the work. The first of these campaigns were conducted in four towns—Durant, Laurel, Crystal Springs, and Woodville—during the fall of 1920, and they were so successful that others were undertaken in the following years. Since 1920 the plant board has supervised this work, while the municipalities and counties have paid the expenses. This work reached its height in 1929, when 121 localities were poisoned for the ants, 1,136,028 *cups of poison* being used at a cost of approximately $35,000. Even in the depression years there has been a steady demand for control work, although the towns and counties have been handicapped by lack of funds.

The early campaigns were designated control campaigns, and the word eradication was not used. In 1924, however, an area embracing a block and a half at Fayette, Miss., was freed of the ants after two successive fall campaigns, at an exceedingly low cost (15). So far as is known, this was the first town, not only in Mississippi but in the world, from which the ants had been eradicated. Later other towns began to eradicate the ants, and by 1928 six—Fayette, Shaw, Lyman, Landon, Moss Point, and State College—had been freed of them (4). Since then State authorities have not only stressed the fact that it is possible to eradicate Argentine ants by timely and thorough campaigns repeated for several consecutive years, but they have encouraged the municipalities and counties to fight the ants in this manner."

These results were obtained by the poison baiting method already outlined and without the use of D.D.T. The latter insecticide enables much quicker results to be obtained and has greatly improved the chances of combating the Argentine ant, providing co-operative action can be stimulated and all treatments are applied with strict attention to detail.

WARNING.

Arsenicals.

Arsenite of soda and Paris green are highly toxic to man and domestic animals and great care should be used to see that all vessels are thoroughly cleaned after use, should any of the formulae be made up at home. Bottles of ant bait should be clearly labelled poison, and care should be taken in the distribution and filling of the bait containers.

D.D.T.

At the concentrations recommended D.D.T. is not highly toxic to man or animals; care should be taken however, not to contaminate foodstuffs and contact with liquids, especially oil solutions, *should be avoided* as much as possible.

SUMMARY.

1. All attempts to combat the pest must be co-operative and sustained.

2. Place tobacco tins or other suitable containers half filled with bait wherever the ants are active (for preference outside the house).

3. Cut or punch holes in sides of tin and close lid for safety and to prevent evaporation.

4. Keep tins clean and add fresh bait at least once a week.

5. Change position of tins from time to time if ants appear to lose interest.

6. Do not relax baiting when there is an appreciable drop in ant activity.

7. Use 4 per cent. D.D.T. powder or 4 per cent. D.D.T. spray on window sills, cracks etc., where ants persist in invading premises.

8. Destroy rubbish such as old grass and leaves as this forms an attractive breeding place for the ants.

9. Spray the foundations of the house, the edges of concrete paths, the butts of infested fruit trees and shrubs, and any other areas where the ants swarm, with a 2 per cent. water mixture of D.D.T.

LITERATURE.

Annand, P. N. *et. al.* 1944: "Tests conducted by Bureau of Entomology and Plant Quarantine to appraise the usefulness of D.D.T. as an insecticide," Journ. Econ. Ent., Vol. 37, p. 145.

Back, E. A., 1937: "House Ants," U.S.D.A. Leaflet 147.

Clark, J., 1941: "Notes on the Argentine ant and other exotic ants introduced into Australia," Mem. Nat. Mus. Vict. No. 12. p. 59.

Eckert, J. E. & Mallis, A., 1941: "Ants and their control in California," Univ. Cal. Agric. Exp. Stat. Circ. 342.

Jenkins, C. F. H. & Forte, P.N., 1946: "1945-1946 Experiments with D.D.T. and 666 as Agricultural Insecticides," Journ. Dept. Agric. W. Aust. (2nd Ser.), Vol. XXIII, p. 311.

Newell, W. & Barber, T. C., 1913: "The Argentine Ant," U.S.D.A. Bull. 122.

Pescott, R. T. M., 1939: "The Argentine Ant," Journ. Dept. Agric. Vict. Vol 37.

Potgieter, J. T., 1937: "The Argentine Ant," Farming in S. Africa, April, 1937.

Smith, M. R., 1936: "Distribution of the Argentine Ant in the United States, and suggestions for its Control or Eradication," U.S.D.A. Circ. 387.

Woglum, R. S., 1921: "Control of the Argentine Ant in California Citrus Orchards," U.S.D.A. Bull. 965.

Woodworth, C. W.: "The Control of the Argentine Ant," Univ. Cal. Agric. Exp. Stat. Bull. 207.

A CRUSH FOR THE TUBERCULIN TESTING OF CATTLE.

A. RIPPER, Stock Inspector.

A STRONGLY constructed crush and serviceable holding yards are a necessity on all properties where numbers of cattle are required to be handled.

On properties where Tuberculin Testing is compulsory and it is necessary to deal with dry stock, bulls and young animals that have not previously been handled the provision of these facilities is absolutely essential.

The crush shown on the accompanying diagrams is specially designed for Tuberculin Testing but will serve equally well for vaccinations, branding or dehorning.

The essential features of this crush are:—

(1) An end bail (E on the diagrams) in which the beast is held while the test is being applied.

(2) An exit gate (D) through which the animal passes out after release from the bail.

(3) A block gate (B) which swings inwards completely blocking the race against the oncoming cattle and allowing sufficient space for the operator to enter the crush at the rear of the beast in order to make an injection of Tuberculin into one of the skin folds at the base of the tail.

The distance from the bail to the block gate when closed across the race should not be less than eight feet which will provide sufficient length to accommodate the largest beast and at the same time leave sufficient space at the rear of the animal to enable the operator to carry out the test.

Provided it is strongly constructed this structure need not be elaborate. No details of timber sizes, hinges, catches or bail design have been included since it is expected that the majority of farmers will have their own ideas and preferences and will make use of material already available on the property. Where sawn timber is not available bush timber will serve the purpose, but whatever material is employed it should not be stinted if a strong and serviceable crush is to be provided.

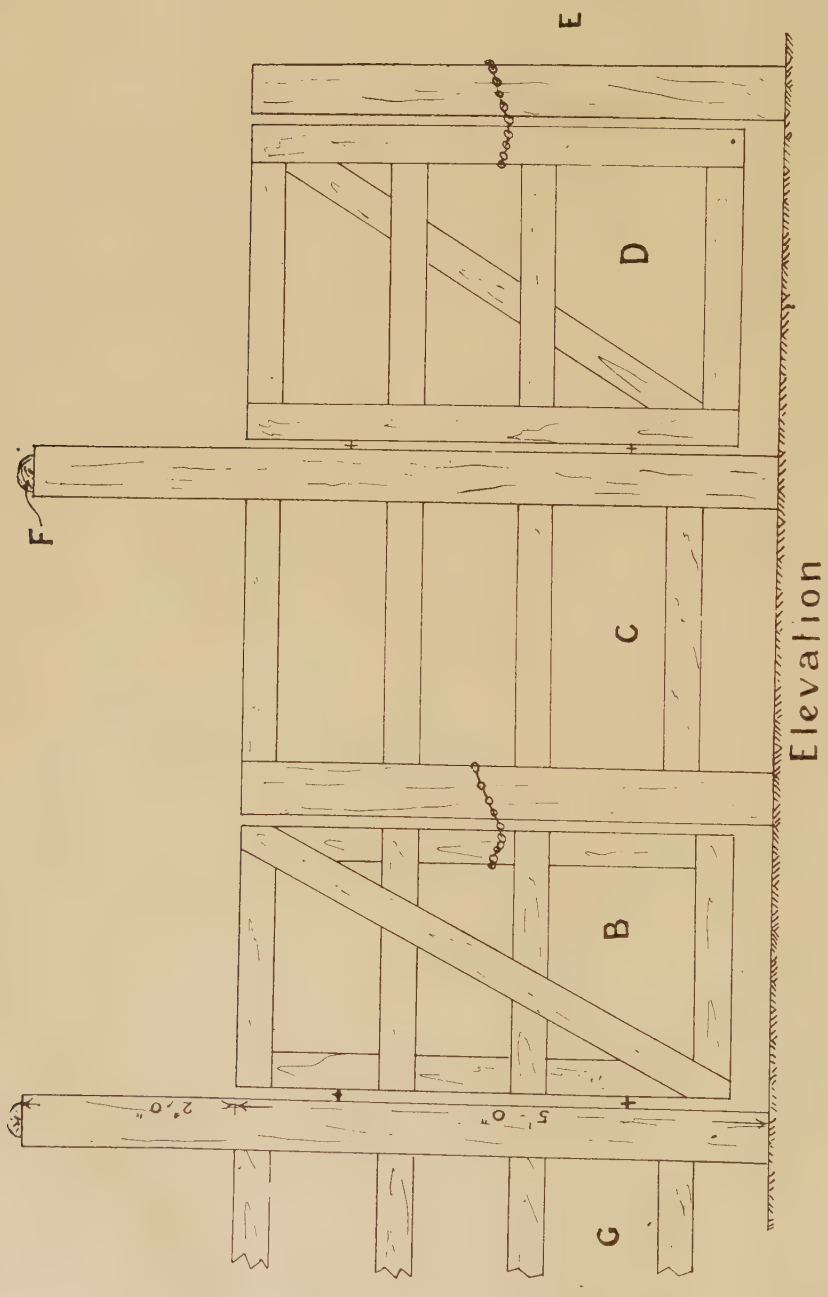
The width of the race is important and should not exceed two feet three inches. This will allow large dairy cows to pass through and will prevent small stock from turning in the race when they are not tightly crushed.

These additional notes will help to explain the diagrams:—

(A) Plan of the crush.

(B) A block gate, three feet wide, opening inwards to block the race (G) to following cattle and to allow access to the rear of the beast.

(C) A panel designed to give added length between the bail (E) and the block gate (B). The length of the panel will vary with the size of the gate used at (D)—together they should give approximately eight feet standing room.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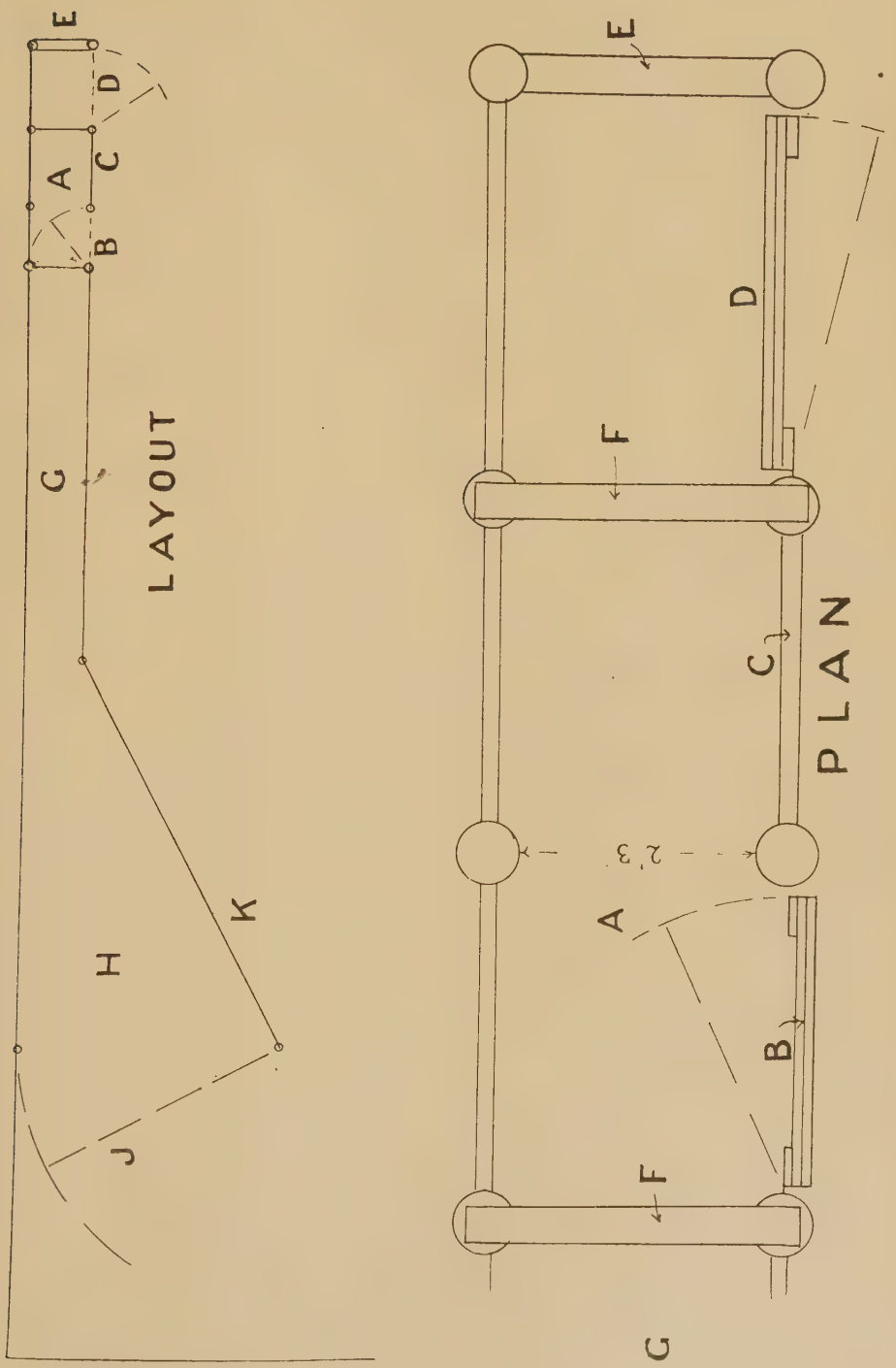


G

(D) A side gate three to five feet wide to allow stock out after treatment.

(E) The end bail constructed to owner's own design but preferably self locking and readily adjustable.

(F) Ties across the gate posts to prevent the gates from sagging or the race spreading under pressure from the stock.

(G) The race. This should be five feet high with nine inches between rails. The length will vary with individual requirements but 20 feet will be found suitable for the average dairy herd. Do not make the inside width greater than two feet three inches.

(H) A force pen for filling the race. This is closed by a large gate (J) from the holding yard (K).

NOTICE.

SPECIMENS FOR ANALYSIS OR DIAGNOSIS.

Kind.	Address to.	Remarks.
Animals ...	Animal Health and Nutritional Laboratories, Smyth Road, Hollywood	
Birds ...	do. do. do.	
Blood ...	do. do. do.	Communicate with laboratory before collecting and despatch where possible.
Insects ...	Government Entomologist, Department of Agriculture	
Milk ...	... ...	Write to Department of Agriculture and ask for sample bottles, at the same time state for what purpose you want the test made.
Plants ... (Diseased)	Government Plant Pathologist, Department of Agriculture	Give full symptoms, details of fertiliser treatment, situation, etc., in accompanying letter. Supply whole plants showing different stages of the disease where possible. Send fresh but not wet specimens without soil. Wrap in paper not airtight tins.
Plants ... (for identification)	Government Botanist, Department of Agriculture	Specimens should show leaf arrangement, flower and fruit whenever possible. Press and dry between sheets of newspaper before sending. Letter should give details of habit, *e.g.*, tree, shrub, climber as well as locality and conditions under which plant grew.
Water (for Analysis)	Government Analyst, Adelaide Terrace, Perth	For *bona fide* farmers a fee of 5s. per sample. A clean bottleful the size of a beer bottle. State where sample is from, *i.e.*, well, dam, etc. In your letter, give description of container being sent and the date sent.

Important.—Wrap securely and clearly address all samples, place sender's name and address on the outside of parcel. Always write advising specimen on its way and if more than one being sent on different days mark them with the date. Parcels should be sent to arrive early in the week, not the week end, so as to be in as fresh a condition as possible.

THE BANANA AS A HOST FRUIT OF THE MEDITERRANEAN FRUIT FLY

By C. F. H. JENKINS, Government Entomologist.

THE banana has never been considered a satisfactory host fruit of the Mediterranean Fruit Fly (*Ceratitis capitata*) and consequently the unusual activity of this fly in Carnarvon plantations last year may prove a matter of considerable importance to the industry. The general view regarding the Mediterranean Fruit Fly and banana infestation is stated by Back and Pemberton (1916a) as follows:—

"While it has been proved that bananas may serve as host fruits of this Fruit Fly when ripe, all data happily corroborate the general belief among shippers and growers as well as among entomologists familiar with the situation, that Chinese bananas and Jamaica or Bluefield bananas (*Musa* spp.) when cut and shipped under commercial conditions, are immune to attack and offer no danger as carriers of this pest if properly inspected and certified as provided for by the regulations of the Federal Horticultural Board."

Kirk and French both reported the occurrence of Mediterranean Fruit Fly in bananas but in critically reviewing the Australian literature Back and Pemberton (1916b and 1918a) consider these records to be very doubtful and recent correspondence from Mr. H. Smith of Queensland and Mr. T. McCarthy of N.S.W. entirely substantiate the views of Back and Pemberton.

Experience in Western Australia has been in accordance with the above views until the present records from Carnarvon and what will be the ultimate importance of these records it is still too early to say. The activity of the Fly was first brought to my notice by the Tropical Adviser for the Carnarvon District (Mr. G. Barnett) who stated that plantains allowed to remain on the breakwind plants were being heavily struck by Fly. Consignments of plantains and bananas (Cavendish) were then obtained for laboratory examination and both maggots and adult flies were obtained.

About ten dozen fruits were examined (having been specially selected in the field as showing Fruit Fly stings) and in a large percentage active maggots developed. In a number of cases the maggots failed to produce flies owing to the appearance of mould on the bananas and their premature breakdown. Numerous adults were reared however, from fruits which remained in a suitable condition. Mr. Barnett reported that the fly activity in the district may have been aggravated by the presence of neglected plantations and by the failure of growers to strip plantains used as breakwinds. The important facts are, however, that the majority of the bananas examined in the laboratory were picked green and in accordance with normal commercial practice and that from these fruits without any artificial assistance, adult fruit flies were reared. In addition to the consignments obtained direct from Carnarvon, one infested fruit was obtained from the Metropolitan markets where it had been offered for sale with a normal commercial line.

The activity of the Mediterranean Fruit Fly in the Carnarvon district will be watched in the future with great interest. Although known from Western Australia since 1895 it was not until 1934 that the insect was reported from Carnarvon. Since then citrus, figs and other well recognised host fruits have been frequently attacked.

There are a large number of hosts credited to the Mediterranean Fruit Fly. Quayle (1938) lists 137 including such plants as tomatoes and cucumbers which although commonly grown in this State have never been found infested. There is no explanation for the fact that a tomato is liable to Fruit Fly attack in Hawaii and is immune in Western Australia (Smith 1940, Back and Pemberton 1918b). There is some evidence to show that the insect may gradually develop a liking for certain fruits and although still not a popular host it is believed that grapes in Western Australia are more liable to attack now than in the earlier years of the industry. To suggest that a preference for bananas is being developed by the Carnarvon flies would at this stage be merely conjecture. This record however illustrates the danger of forecasting the potentialities of any pest or of placing too much reliance upon results obtained in other countries under environmental conditions differing from one's own.

The whole history of the Mediterranean Fruit Fly in Australia supports this contention. It was expected that this pest would prove a serious pest throughout the fruit growing areas of Australia. In Western Australia it has made steady progress. In Queensland it has never been bred from locally grown fruit (Smith 1939) and in N.S.W. where it was once troublesome it is now scarce and has been supplanted by the Queensland Fruit Fly.

Banana showing punctures made by ovipositing Fruit Flies.

REFERENCES.

Back, E. A. & Pemberton, C. E., 1916a: "The Banana as a Host of the Mediterranean Fruit Fly," Journ. Agric. Res. Vol. V., p. 793.

Back, E. A. & Pemberton, C. E., 1916b: *ibid.* p. 801.

Back, E. A. & Pemberton, C. E., 1918a: "The Mediterranean Fruit Fly in Hawaii," U.S. Dept. Agric. Bull. No. 536, p. 40.

Back, E. A. & Pemberton, C. E., 1918b: *ibid.* p. 38.

Quayle, H. J., 1938: "Insects of Citrus and other Sub-tropical Fruits," Comstock Pub. Co., N.Y.

Severin, H. H. P. & Hartung, W. J., 1912: "Will the Mediterranean Fruit Fly (*Ceratitis capitata* Wied.) breed in bananas under Artificial and Field Conditions," Journ. Econ. Ent. Vol. 5, p. 443.

Smith, J. H., 1939: "Insects and their Influence on Agricultural Development," Journ. Aust. Inst. Agric. Sci., Vol. 5, p. 148.

Smith, J. H., 1940: "Corrigendum," *ibid.* Vol. 6, p. 59.

CLASSING FARMERS' CLIPS FOR AUCTION.

W. L. McGARRY, Sheep and Wool Adviser.

THE correct classification of farmers' comparatively small clips is a task which will prove definitely profitable and can also prove very interesting. At times various factors militate against the best possible "get up" of the wool by farmers themselves, and these would include labour shortages and lack of adequate facilities. These factors, and at times a lack of confidence in their ability to class the clip, induces growers at times to consign their unclassed clips to brokers for reclassing before sale.

Very little, if any, technical wool knowledge is required to class the average farmers' clip to the best financial advantage. Classing of such clips to the best matching of similar fleeces into as few and as big lines as possible, out of which must be kept the odd irregular or "outsort" fleeces which do not match the main lines. The main qualifications required in the correct matching of fleeces are common-sense and good eyesight allied to adequate shed facilities, and an interest in the job being undertaken.

In the main it is more profitable, provided a reasonable job is done, to class all clips on the farm "hot" off the sheep's back. The double handling and double pressing that is involved with the reclassed clip can be detrimental to its appearance or "bloom" when it is opened up with a consequent effect on the value. This applies particularly where the sheep have been run on country that is loose in nature and where dust is prevalent. In addition to this, the cost per sheep for classing is much cheaper when done in the shed (even with a paid classer) than in the reclass store. It is obvious that where the farmers do their own classing a direct saving of the total reclass charge is made.

Apart from these considerations, an intimate knowledge of the covering the sheep are producing is very necessary in any policy of flock improvement, and this knowledge can only be fully acquired at the classing table.

Shearing Shed Facilities.

The returns from wool sales represent a large proportion of farmers' incomes today, and in view of the importance of wool in this respect, it is essential that every consideration be given to factors affecting its preparation for market.

These include:—

Adequately designed sheds that will allow of sufficient space for shearing, wool bins, wool tables, press and plenty of light.

If good work is to be done at shearing time, these things are indispensable and it is disconcerting to record that comparatively few sheds in the farming areas possess adequate facilities that are indispensable to good classing.

Wool Sheds.

On the majority of farms, these serve the manifold purposes of shearing, storage, machine sheds, etc., and it will be found that, in most cases, some rearrangement of the shearing board, bins, wool tables, etc., will minimise faulty work, confusion and delay at shearing time, and enable the best use to be made of the available space and light.

There are many plans and designs of shearing sheds available to choose from and in the erection of shearing sheds the following points are well worth remembering.

1. Shed space must be laid out economically to ensure the most efficient handling of sheep and wool, and in planning the wool room it is necessary to aim at a quick, clean, handling of the fleece with the wool travelling in the one direction towards the press.

2. It is a definite advantage to build the shed off the ground. Advantages with these types of sheds are:—

   (i) The space underneath can be used to house woolly sheep overnight and in the event of rain.

   (ii) If the shed floor and adjoining ramp are built to the level of the floor of a motor truck, the labour involved in handling, storing, and loading super, seed wheat, wool etc., is considerably reduced. Heavy laborious lifting is avoided in this manner, and this applies particularly to periods during labour shortage and where large areas are to be topdressed or seeded quickly.

   (iii) A shed built off the ground allows easy cleaning from under the sheep pens.

Catching Pens.

Penning up can be made much easier if the side of the catching pen facing the shearing board is close boarded or covered to a height of about six feet. In this way the movement of the shearers and others working adjacent to the sheep on the board is obscured, and as a result, the sheep will run much easier when being penned.

Lighting.

The question of light is particularly important in view of the fact that the bulk of shearing is done when the days are short and often cloudy.

A good light is essential if the clip is to be classed to the best financial advantage, and in addition a good light enables the classing to be carried out quicker and easier. Very few shearing sheds in farming areas are sufficiently lighted to class wool properly, and the question of light seems to be one that is overlooked or ignored by many farmers when constructing their sheds or when arranging their sheds in preparation for shearing. Farmers are not doing justice to their clip or their pocket in preparing their wool for market in a poor light and then subjecting it to the acid test of display and valuation under the excellent lighting of a wool showfloor.

Bad light also hampers the handling of the sheep in the shed and is certainly not conducive to good shearing. Sheep will move into lighted pens quicker, and with less trouble than if the pens are in semi-darkness, which is applicable to many sheds. When sheep are driven out of strong sunlight into a dark shed, trouble is experienced in getting them housed, and this is largely overcome when a shed is well illuminated with natural light.

Factors conducive towards improved lighting in shearing sheds are:—

1. Installation of saw-tooth type of roofs.
2. Installation of skylights.
3. White washing of the inside walls and roofs of sheds. This will improve the lighting considerably at a small cost.
4. Temporary removal of a few sheets of iron from the roof during shearing—avoid sun glare.
5. Rearrangement of pens, wool bins, wool tables and shearing board, so that the available light can be used to the best advantage.
6. Replacing the galvanised iron or board sides of wool bins with wire netting or battens.

Wool Tables.

An adequate wool rolling table is indispensable if the preparation of the fleece for classing is to be done efficiently and expeditiously. The work involved on the wool rolling table is most important, because it is at this stage that the initial, and probably most serious faults occur in the "get-up" of the clip. Half the classing is done if the skirting, backing and rolling is correctly and quickly carried out, and the provision of an adequate wool rolling table is absolutely essential if efficiency and speed in fleece preparation are to be achieved.

Good work is possible only on a table of satisfactory dimensions, and wool rolling tables should be of sufficient length and width to accommodate a fleece that lays flat without it overhanging the sides or the ends of the table.

The minimum length and width of a wool rolling table should be 10 ft. x 5 ft. with batten space ¾ in. to 1 in. apart. It is definitely preferable to have a table a little on the large side than to have one on the small side. The big majority of tables in use today are too small for good work and these could be enlarged to an adequate size at little cost with extensions in the form of flooring boards, or additional battens fixed to the sides and/or ends of tables.

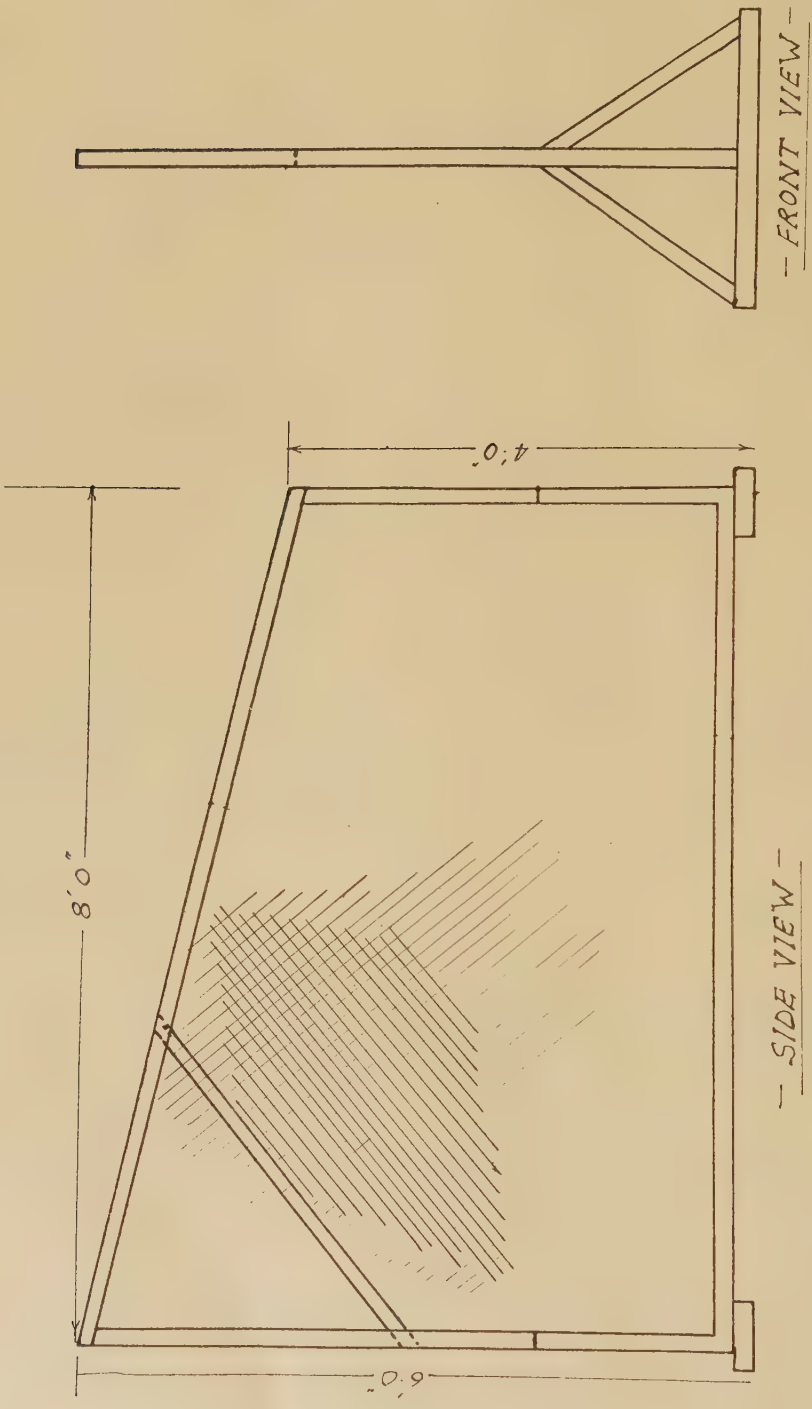
Folding legs or trestles are a definite advantage over fixed legs on a wool table, in that the table can be stored in the shed in a minimum of space when not in use.

Wool rolling tables should not be too low or too high as this is not conducive towards good work. Wool tables that are too high and too low can also prove very fatiguing to work on at length. Efficient skirting is impossible if the table is placed against a wall. It is necessary to arrange the table so that the skirter can move around it freely.

Floor boards or hessian placed around the legs of the table temporarily will keep floor pieces and dags out and save the time involved in shaking these out of the table locks.

Wool Bins.

It is necessary to have at least six bins in the average farmer's flock of 1,000 to 1,500 sheep. In larger flocks more bins are necessary and in the rush of shearing more bins mean better classing, more convenience, less work and less double handling. One disadvantage of fixed bins is that they limit the space for storage after shearing. Another drawback is that these bins are generally made the same



PORTABLE WOOL BIN.

size, with the result that there is insufficient room for the main lines and too much for the other lines. Fixed bins are usually close boarded or made with galvanised iron sides, and as a result are generally lacking good illumination. Plenty of light should penetrate each bin to enable the classer to see that the various lines are kept uniform and to allow of comparison of neighbouring lines of wool. It is an advantage to avoid placing wool bins against a wall if possible. If they are arranged so that the presser can obtain the wool from the back of the bin, this will give the presser, classer and other shed workers full freedom of movement without delaying or interfering with their work.

Portable Wool Bins.

The portable or movable type of wool bin is recommended and its advantages are:—

1. After shearing these can be moved into the sheep pens and this allows the use of the maximum storage space for super, grain, etc.
2. Convenience in small sheds. Portable bins are easily adaptable to suit any size of bin necessary to accommodate the amount of wool required for various lots.
3. Better light penetration to each bin.
4. Can be moved or placed anywhere in the wool room during shearing.

Portable bins can be made of light timber (8 ft. long and 6 ft. high) in the form of frames, with the uprights fitting into "feet."

Uprights—2 in. x 2 in. x 6 ft.

Cross pieces—2 in. x 1½ in. x 8 ft.

Foot pieces—3 in. x 2 in. x 18 in.

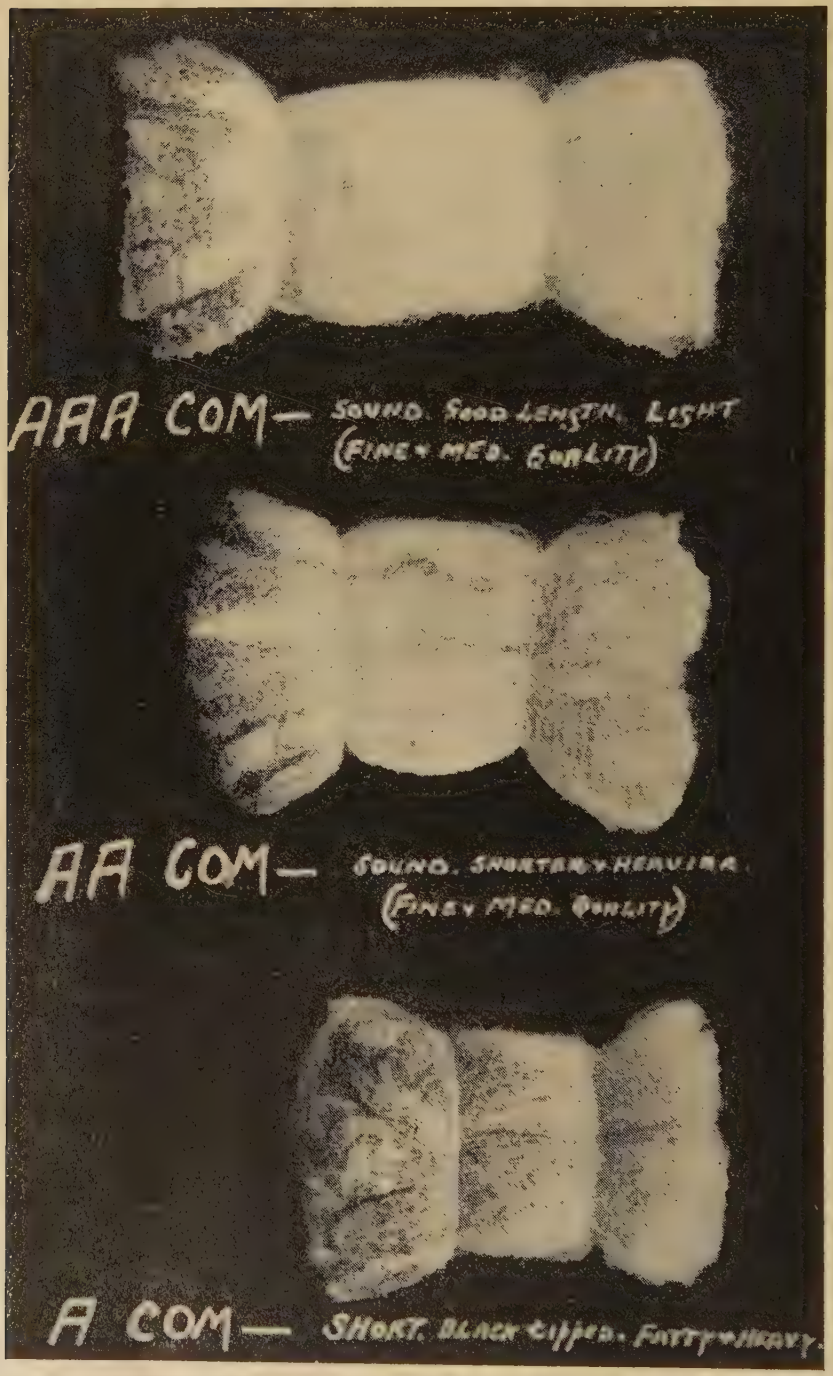
It is necessary to cover the frames with wire netting and this should be stretched tightly across the frame.

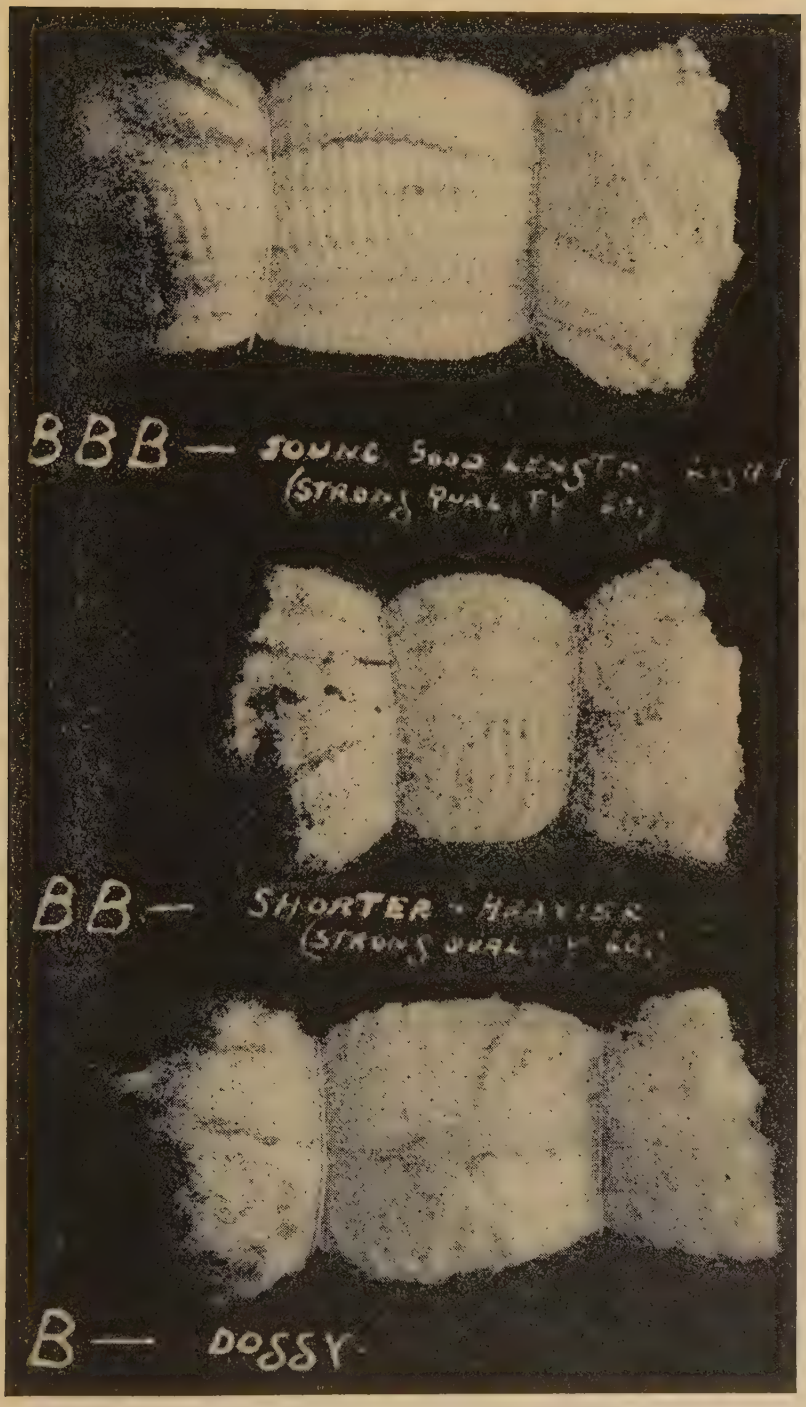
This type of bin could also be made of ½ in. piping.

ESTABLISHING THE LINES.

The decision as to how the clip is to be classed, what lines to make, etc., has to be made during the first day's shearing, and the importance of the first day's work in setting the lines correctly—or laying the correct foundation on which to class—cannot be over-emphasised. The most difficult part of classing any clip is during the first day, when it is necessary to set out or match together a few fleeces into those lines or grades which only are warranted and which are sufficient to cater for the whole clip. It is necessary for the fleeces in these grades to be sufficiently even that they will blend profitably as a line, and the number of grades or lines must be sufficiently few to enable reasonably big lines to be made in the clip.

It is recommended that the main objective during the first day's shearing should be "to get the eye in" to the wool coming off and the correct setting up of the lines to be made. Plenty of time spent in this direction is well spent and will save time and uncertainty and eliminate irregular and unprofitable classing as shearing progresses.


AAA COM— SOUND. GOOD LENGTH. LIGHT
(FINE & MED. QUALITY)
AA COM— SOUND. SHORTISH & HEAVIER.
(FINE & MED. QUALITY)
A COM— SHORT. BLACK TIPPED. FATTY & HEAVY.


BBB — SOUND GOOD LENGTH
(STRONG QUALITY 60)
BB — SHORTER - HEAVIER
(STRONG QUALITY 60)
B — DOSSY

Before setting the lines it is a definite advantage to get the "feel" of the clip first, by stacking the first 40 or 50 fleeces in the corner of the shed or in a spare bin as they are shorn—after an examination and handling on the wool rolling and classing tables. These fleeces can be classed out later when the lines have been made. Having a good "look" at the wool in this way before establishing the lines, assists in a correct appraisal of the average quality and type of the wool to follow and assists to "get the eye in" quickly to the correct matching of the next 30 to 40 fleeces into established bulk lines, which will absorb the majority of the clip. Becoming familiar with the wool in this way at the outset eliminates much uncertainty and changing of fleeces afterwards when the lines are being established.

Matching.

Wooldassing is only another name for the matching into lines of fleeces that are similar in length, quality, condition and soundness, and naturally fleeces that are similar in these characteristics will go together. Matching that is more true and more quickly performed will follow an observance of the "golden rule" of all wool work, i.e. the first impression is the best.

Quality.

Quality refers to the thickness of the fibre (count). Merino qualities or counts used are 70's (fine), 64's (medium), 60's (strong). Do not be concerned with the figures or counts when classing, but be guided by the crimp formation and general appearance, and think in terms of fine, medium and strong wool. Narrow crimping denotes fineness and broad crimping, strength, or thicker fibres.

As far as quality is concerned, fine and medium fleeces can go together, but it is most important where practicable to keep strong quality fleeces (60's) out of the medium and fine wool lines. It is more important to keep the odd strong fleeces (60's) out of the medium fine lines than the odd 64/70 fleeces out of the strong lines (60's).

Extra strong fleeces of lower than 60's quality and "doggy" fleeces should be kept out of all the main lines. If there is not enough for a bale these types can be bagged or baled with other "outsort" fleeces into a mixed bale and sent to the brokers for bulk classing.

Outsort Fleeces.

Outsort fleeces embrace all those irregular and inferior fleeces which will not match the main lines; the value of which is lowered if they are left in. These irregular fleeces include the matted, overstrong, very discoloured, doggy, rams, black tipped, rotten, heavy and fatty, very short types, etc. There are always a number of these cast fleeces in every clip.

Quality Affects Values.

Quality, or fibre thickness, is under present world demand the most important factor in determining the value of merino wool today, and this position is likely to remain for some years to come. World stocks of 64's and finer are low and are likely to remain so, as these types are going into consumption faster than they are being produced. This position is reflected in the keen demand and high prices paid for these types during the last woolselling season.

To receive maximum returns under present auction conditions classing should be modified accordingly, and more attention must be paid to quality when classing than hitherto, and where practicable strong quality fleeces (60's) kept out of the medium and fine quality lines (64's and 70's.)

Under the Appraisement Scheme only a small price margin existed between fine, medium and strong merino wool, and length was more important than quality, but the reverse applies today. This is illustrated in the following table of clean limits for "good topmaking" style wools. The "good topmaking" style of wool applies to the big bulk of farmers' clips which are valued under this type.

Good Topmaking.

Appraisement Limits.		Present Limits.	
Quality.	Clean.	Quality.	Clean.
70's	30½d. lb.	70's	130d. lb.
64's	29½d. lb.	64' s	124d. lb.
60's	27½d. lb.	60's	109d. lb.

(*Note.*—These were values at Sale on 14th June, 1948.)

Under Appraisement limits and working on a 60 per cent. yield, the difference (greasy) between a 64 and a 60 of this type would be :—

64's $29\frac{1}{2} \times \frac{60}{100} = 17\frac{7}{10}$d.
60's $27\frac{1}{2} \times \frac{60}{100} = 16\frac{1}{2}$d.
} $1\frac{1}{4}$d. lb. in favour of 64's.

As compared to present limits :—

64's $124 \times \frac{60}{100} = 74\frac{2}{5}$d.
60's $109 \times \frac{60}{100} = 65\frac{2}{5}$d.
} 9d. lb. in favour of 64's.

Length.

This refers to the average length of the staple and when classing merino wool it is necessary to think in terms of :—

Good Length 3½ to 4″ (Warp)
Medium Length 2½ to 3″ (Half Warp)
Short Under 2½″ (French Combing)

In years when seasonal conditions are good, warps (bulk top line) naturally will be plentiful. However, when the clip is not well grown all the wool will be correspondingly shorter in staple and the half-warps would be the bulk top line.

Condition.

This refers to the amount of yolk etc., in the wool and it is necessary to differentiate between light, medium and heavy variations in condition. It is necessary to lift the fleece off the classing table to arrive at a reliable estimation of its condition. Do not be misled by colour when estimating condition. A bright fleece is not always light conditioned and a fleece that is "off colour" (not bright) is not always heavy conditioned.

All fleeces with a pronounced heavy black tip and heavy fatty fleeces must be kept separate and not included in the medium conditioned lines.

Soundness.

This refers to the tensile strength of the fibre which is subjected to tension during the combing process. This strain is about equal to a 7 lb. tension on the average staple of wool. Sound wool will withstand this approximate 7 lb. pressure when applied by hand. Unsound or tender wool will give or break under the strain. Inconsistency and errors of judgment will occur when testing wool for soundness, unless the same tension is applied to the same thickness of staple for each fleece.

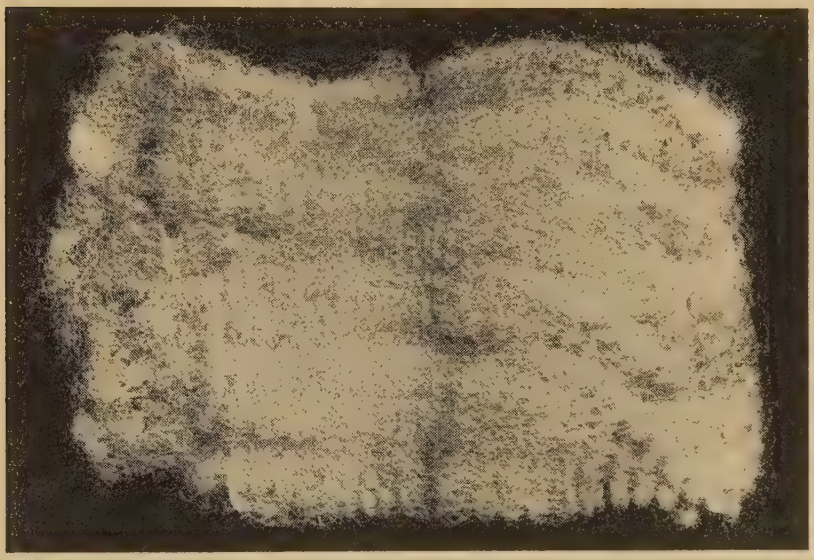
AAA FLC—Tender wool fibres have broken under tension.

To test for soundness, grasp the tip of the staple between the thumb and forefinger of the left hand and the butt of the staple between the same fingers on the right hand, and apply a steady pressure of about 7 lbs. Keep all tender fleeces out of the main sound lines. If there are not enough tender fleeces for a bale or a line, bag them or make a mixed bale with other "outsort" fleeces for the bulk class.

If the big majority of the fleeces are tender, ignore this factor and class on quality, length and condition.

Number of Lines to Make.

The number of lines made is dependent upon the size of the flock and the amount of wool to be handled. Lines as big as possible should be made and overclassing should be avoided. Under the present auction conditions, experience indicates that a few big lines of fleece wool that are reasonably even, are more profitable than a number of small lines. In these bulk lines, the top fleeces "carry" the average fleeces with the result that generally a higher *average* price per lb. results than if the wool had been classed out closely into smaller and probably more uniform lines.



BREAK IN WOOL, i.e., rotten.

To receive full advantage of classing in this manner however, great care must be taken to keep out of the bulk lines the odd irregular fleeces that do not match.

When setting or establishing the lines, do not set the standard of the top line too high, set the standard according to the wool before you, and have a good distinction between the tops and seconds. *Make plenty of top line* even if it is not as good as you would like –the second line will by comparison be correspondingly inferior in appearance and lower in value if the lines have been soundly established. Big top lines are not possible if the standard is set too high at the commencement of shearing. Big top lines are profitable and *increase the average price per lb. over the whole clip.*

The *average price per lb.* is more important than the individual price per lb. for various lines, and it is *the* important factor as far as total cash returns are concerned.

Description and Number of Lines.

Lines can be made from the following description, according to the size of the flock, and for larger clips extra lines may be made where warranted.

SMALL MERINO FLOCKS OF UP TO 500 SHEEP.

AAA COM	Longest, brightest and lightest.
AA COM	Shorter, heavier and less attractive. All outsorts (rough, very fatty, very tender and rams etc.) to be put into bags or mixed bales.
AA PCS	One line, stains removed.
AA BLS	One line, stains removed.
STD PCS	
LKS	
AAA LAMBS	One line, stains removed.

FLOCKS OF 500-1,000 SHEEP AND OVER.

AAA COM	Sound, good length, light condition (fine to medium quality).
AA COM	Sound, shorter, heavier (fine to medium quality).
BBB	Sound, good length, light to medium condition, strong quality.
AAA FLC	Average length, fine to medium, tender.
AAA BKN	Backs and necks.
AA PCS	Pieces. Stains removed.
AA BLS	One line. Stains removed.
STD PCS	One line. Dags removed.
LOCKS	One line. Dags removed.
AAA LBS	Longest. Stains removed.
AA LBS	Shorter. Stains removed.

COMEBACK AND CROSSBRED FLOCKS OF UP TO 500 SHEEP.

AAA CBK	Finest to medium quality.
or	
AAA XB	
AA CBK	Medium to strong quality. Outsorts, such as cotty, discoloured
or	and faulty fleeces to be kept separate.
AA XB	
AA PCS	One line, with stains removed.
AA BLS	One line, with stains removed.
STD PCS	
LOCKS	
CBK LBS	Fine quality, stains removed.
XB LBS	Medium to strong quality, stains removed.

COMEBACK AND CROSSBRED FLOCKS OF OVER 500 SHEEP.

AAA CBK *or* AAA XB	Good length, light to medium condition, fine quality.
AA CBK *or* AA XB	Good length, light to medium condition, medium quality.
A CBK *or* A XB	Shorter, heavier, fine and medium quality.
AAA CBK FLC *or* AAA XB FLC	All tender fleeces.
XB	All very strong quality fleeces. All cotty, discoloured and very rough fleeces into bags.
AA PCS	One line, stains removed.
AA BLS	One line, stains removed.
STD PCS	One line, dags removed.
LKS	One line, dags removed.
CBK LBS	Fine.
XBD LBS	Medium to strong. Short Lambs and Lamb skirtings into bags.

Picking Up and Throwing.

If the fleeces are picked up and thrown correctly, the whole "get up" will benefit because the fleeces can be skirted much more efficiently and expeditiously when they are thrown so that they lay flat on the table.

A little time and trouble spent by the picker-up in this important aspect of shed work is reflected in better work and better classing throughout the shed. A little attention to straightening and disentangling the points of a fleece as the shearer is finishing the last few blows can, and does often, mean the difference between good and bad throwing, and consequently good and bad skirting and backing.

Frequent use of the broom should be made by the picker-up to avoid dags, second cuts, sweaty ends, etc., from the previously shorn sheep being gathered into the fleece as it is picked up.

Skirting and Backing.

Maximum returns are dependent upon efficient skirting and it is essential that fleeces are carefully skirted for sweat, stain, seed and burr, and also any rough breech pieces. Discretion must be used as to the depth or amount of skirting necessary. The volume of skirtings removed can vary with seasonal conditions, which govern the amount of seed and/or burr, dust and foreign matter in a fleece.

Careless or faulty work at the wool-rolling table can result in over skirting, which is definitely unprofitable. Over skirting builds up the piece lines at the expense of the more valuable fleece lines—in other words it *increases* the quantity of *lower* priced wool and *decreases* the quantity of *higher* priced wool.

Those portions of the back and neck wool which are too thin, short, dusty, etc., to match the rest of the fleece, should be removed, and inspection on the rolling table with the tip side up is essential to determine the degree of backing necessary. Indiscriminate removal of backs and necks is unprofitable and results in much wool which could have been typed as fleece, being relegated to a broken type at a lower value. Profitable classing calls for as much fleece wool in a clip as possible.

When backs are removed and a line is made, this wool must be kept separate and branded BKN.

Wool Rolling.

Neat, compact, well rolled fleeces with the shoulder wool wrapped around the fleece have definite advantages lacking in slovenly and carelessly "rolled" fleeces. These advantages are:—

1. The wool opens up more attractively on the showfloor.
2. Handling is facilitated when carrying to the bin and when pressing.
3. A greater degree of consistency and evenness in the classing and better distinction between the lines is facilitated.

Pieces and Bellies.

Piece and belly lines in *all* clips should be free of urine stains, second cuts and locks. It is not advisable to make more than one line of pieces and bellies in small clips, but in larger clips it will pay to pick the pieces and bellies, and two lines can be made where warranted.

Pieces should be thoroughly shaken to eliminate locks and second cuts. Piece lines that are locky will go down in type, yield and value.

Locks and Stains.

At the present high levels these types warrant more attention than they usually receive. The stained piece line should take only urine and excretion stains from the breech end of fleeces, together with belly pizzle stains. If the stained content is heavy due to lack of crutching, lush season etc. breech skirtings should be trimmed carefully, because the presence of over much clean wool in stained piece lines is unprofitable, and clean piece lines containing stains will be reduced in value as a result of this fault.

Locks should be shaken in order to eliminate dags and pieces. The inclusion of dags results in the paying of freight on something that is worthless, and the pieces will bring more money if included in the piece line.

Lambs.

Only one line should be made in small clips. Where warranted, two lines can be made, grading the wool for length and aiming at a good distinction. It is important to keep lamb lines free of urine stains—ignore sweat.

Brands.

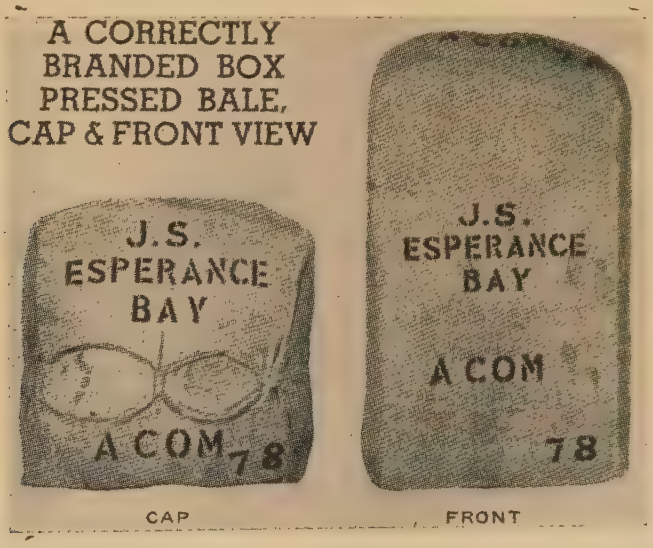
Where woolbrand fault is excessive and prevalent, the brand should be removed and bagged separately from the other wool. When brands are completely removed it is advisable to notify the broker accordingly.

Downs Type of Wool.

As most of the Downs wool types carry brown, black or grey fibre, it is important that it is not mixed with any other wool. Wool of this type should be branded according to breed and bagged if there is insufficient for a bale. Where growers of fat lambs of the Downs breeds have a number of lambs left on their hands that are shorn at the general shearing, the wool when shorn should be kept strictly apart from other wool, and placed into bales or bags without skirting.

Pressing and Branding.

Neat, well pressed bales facilitate handling, save packs and are a general all-round advantage. When pressing it is advisable not to make the bales containing top line wool too heavy. It is an advantage also if the weights of such bales are kept fairly even and without a great variation in poundage. The conservation of wool packs is an important item at the present high price for packs, and a reasonable high overall bale average is necessary in order to conserve packs. This can be effected by increasing the weights in the lower or inferior lines, which will not lose anything in appearance when opened up, through heavy, but not excessive, bale weights.



The bales in the clip must be numbered consecutively from number one on to the end of the clip with oddments following in sequence. Do not duplicate numbers in any one season.

It is recommended that a plain brand which is distinctive and bold be used with the owner's initials over the name of the property. The initials serve as a distinguishing mark as many farm names are duplicated. Stencil plates only should be used, and the letters of same should not be too small. Do not use horse, cattle, wheat and wool brands.

The brand, description and bale number should be clearly marked on the front and top of each bale. Do not brand on the bottom of the bale as this is required for shipping marks. The front of the bale should be the side with

the seam all round. Where no mechanical press is available and fixed top packs are used, the same method applies, but the *front* of the bale should be opposite to the side to which the cap is attached.

The minimum weight of a "full weight" bale of greasy wool is 200 lbs.—bales containing less than this are sold on their own separately as "light weights" at reduced rates.

It is recommended that the classer or grower sends the wool broker a brief report on the clip, giving the bale numbers of any "splits" in the flock and stating where and at what bale number a change has occurred in the wool. This could occur through a change in country, a different paddock, or a change of flock during shearing.

OAT AND BARLEY TRIALS, 1946-1947.

DURING the above period, six oat and barley trials were conducted at various centres in the south-west. The results of these trials in hay yields per acre, are given in the following table:—

Farmer.	District.	Year.	Algerian.	Dale.	Fulghum	Guyra.	Ballidu.	Wongan.	Atlas.
W. A. Beaney	Denmark....	1946	0.69	0.37	0.53	....	0.61	0.63	0.32
Denmark R. S.	Denmark....	1946	1.67	1.43	1.11	....	1.15	1.03	..
W. Dempster	Cowaramup	1946	0.81	1.01	0.87	....	0.65	1.05	1.05
J. Hanks	Harvey	1947	2.84	1.46	2.40	2.05	2.68	1.32	
H. Manson	Jardee	1947	2.70	3.06	2.76	2.20	2.18	1.62	
W. K. Walters	Bridgetown	1947	4.60	3.40	3.20	4.10	2.30	2.50	2.50
Total	....	....	13.31	10.73	10.87	8.35	9.57	8.15	3.87
Mean	....	....	2.22	1.79	1.81	2.78	1.59	1.36	1.29
Per cent.	....	....	100	80.6	81.5	125.2	71.6	61.2	58 1
No. Trials....	....	....	6	6	6	3	6	6	3
		In Tons /Acre.							

From the above Table it will be seen that of the six varieties of oats, five of them were included in six trials and one was included in three trials which were conducted during 1947. The Atlas barley was only included in three trials.

The results show that Algerian oats have given reasonably good yields throughout, but the variety Guyra which was only grown in 1947 has out-yielded all the other varieties, but on analyses it will be seen that it still did not give the yield of Algerian for the year 1947.

Barley and Wongan oats have given the lowest hay yields for the two seasons.

The following gives the information of each trial as supplied by the District Officer:—

1946. *W. A. Beaney, Denmark.*—Trial conducted by C. Tobin, Dairy Instructor, Denmark.

Seasonal conditions in 1946 were unfavourable for the trial and results were therefore disappointing.

Opening rains did not fall until May when the trial was sown. Following the sowing, very cold weather set in causing germination and growth to be slow and weak. For this reason it was not possible to graze the plots.

Harvesting was carried out on the 31st October and 10th November, with Algerian and Dale varieties being the last harvested.

1946. *Denmark Research Station.*—Trial conducted by V. Weston, Manager Research Station, Denmark.

This trial was not grazed at any time owing to adverse season.

The site selected had a fair slope from east to west which should have ensured good drainage. This however, was not the case. A considerable area particularly on the north and south sides, was waterlogged until the late spring.

At harvesting, all varieties were very patchy with a stunted growth of 18 inches to 24 inches on the waterlogged patches, and a well-stooled growth about four feet high on the central well-drained ridge running crossways through the plots.

The barley gave no results as pests kept this down during the early stages and allowed weeds and grasses to choke it out.

All varieties started heading between 16/9/46 and 19/9/46. Green weights were taken on 23/10/46 for Fulghum, Wongan, and Ballidu, and on 28/10/46 for Algerian and Dale, as these were later varieties.

In the green weight estimation a four foot six inch mower cut was taken for six chains through the centre of each plot. The entire six chains were picked up, sheafed, weighed and then stooked.

The later maturing varieties, Algerian and Dale, appear to give the best results particularly in the hay yields.

1946. *W. Dempster, Cowaramup.*—Trial conducted by V. Monti, Dairy Supervisor, Margaret River.

Oats and barley varieties were sown on the 3rd June. The rate of seeding was oats two bushels per acre, barley one and a half bushels per acre, with one bag of superphosphate. Each variety was sown in triplicate giving a total of 18 plots in all.

Inspections prior to harvesting showed that plots one to seven were giving better growth than plots eight to 18. This variation was due to the dry season and the fact that plots eight to 18 were on higher ground which tended to dry out.

Three grazings were carried out during the early part of the season and the last grazing was at the end of August.

Harvesting was done by a four and a half foot mower on the 19th November and green weights obtained. Seven days later on 26th November, hay weights were taken as by this time the hay was fit for stacking.

1947. *J. Hanks, Harvey.*—Trial conducted by G. Gauntlet, Agricultural Adviser, Harvey.

This trial was planted on the 20th May on an area nine chains by five chains. Six varieties of oats were sown in triplicate giving a total of 18 plots. All oats were sown at rate of two bushels per acre and superphosphate was applied at the rate of two cwt. per acre.

Owing to excessively wet conditions occurring early in June, the plots were partly spoilt by waterlogged conditions. The results gave a fairly good indication as to what the plots looked like. Owing to the waterlogged and boggy nature of the ground grazing was not carried out at any stage of growth.

The variety Algerian was consistent in growth throughout the three plots. The growth and yield average of Fulghum was spoilt by a badly waterlogged plot, but this variety appears to be suitable for the general conditions in this area.

Ballidu was erratic in growth while the Guyra was fairly uniform and consistent. Wongan and Dale do not appear to be suited to the conditions, as being fairly early varieties they matured before harvesting could be carried out. These varieties may do better if grazing could be carried out on the early growth or if sown after the July rains.

1947. *H. Manson, Jardee.*—Trial conducted by J. McNally, Dairy Adviser, Manjimup.

This plot was a hillside originally timbered with karri and red gum. Settlement of the farm took part in the period that the Group Settlement Scheme was introduced and from then on the area was partly cleared. For over five years the farm was only used as a grazing proposition and it is doubtful whether any fertiliser was applied during that period.

When the farm was occupied by Mr. Manson, the plot in question was carrying a heavy crop of bracken fern; this was slashed, burnt and the ground ploughed; the oats were planted on the ploughed ground at the rate of two bushels per acre, cultivated in with scalloped disc, which made a good seed bed. Date of planting was 21st May, 1947. Fertiliser at rate of two cwt. superphosphate, plus five pounds of copper per acre.

An inspection at the end of July when the oats were above nine inches high showed that bracken fern was coming away rapidly and a subsequent inspection showed that the ferns were checked and that the oats were growing with renewed vigor.

Later in the season, patches of oats showed signs of some trouble, the leaf tips withering, extending back to the stalk and finally the leaf dried up. Other leaves began to wither in the centre, whilst others showed a ribboning effect: that is light and dark green markings, extending the full length of the leaf, indicating the possibility of both copper and manganese deficiencies.

As the weather warmed up, much better growth was made by all varieties, although patchiness was still evident.

The varieties sown were Dale, Ballidu, Algerian, Fulghum, Wongan and Guyra, all varieties gave a very good germination. Rabbits were bad at various times during growth and seemed to pay particular attention to Guyra; this was noticeable particularly later in the season. Ballidu, Fulghum and Wongan matured about two weeks earlier than the other varieties. The plots were planted on the randomised system with three replications of each variety.

1947. *W. K. Walters, Bridgetown.*—Trial conducted by K. W. Simes, Dairy Instructor, Bridgetown.

The soil was typical of that found in the district, a fairly deep, red loam on a gentle slope to the river. The land had been cleared for a considerable

number of years and given alternatively over to pasturage and cropping. The field occupied 10 acres and the trial covered an area of seven acres.

Rainfall.—Average 33 to 34 inches. In the season 1947, 41.27 inches were recorded.

The oat varieties, were Wongan, Algerian, Dale, Fulghum, Ballidu and Guyra, and together with an acre of Atlas barley were sown in triplicate.

The land was ploughed very early in the season and worked with a disc cultivator and harrows to reduce weed growth. The seed was drilled during the last week in May. Sowing rates: Oats two bushels per acre, barley one and a half bushels per acre. Fertiliser was applied at the rate of one bag per acre (coppered superphosphate).

Within 10 days there was a good germination of all varieties and from subsequent observations it was difficult to select any particular variety of oat that was making better growth than others. The barley was disappointing. It is possible the wet conditions which prevailed did not suit the crop. Portions of the area in which the barley was sown were not well-drained and the plant roots were affected.

During the early spring months, the Guyra, Fulghum and Dale varieties forged ahead and came into ear. The Algerian did not do so well but towards the close of the spring they made very rapid growth and from a cursory examination appeared the best oat in the field.

Crop estimates were made in mid-November.

THE CONTROL OF ROOT-KNOT OR EELWORM-GALL DISEASE BY SOIL FUMIGATION WITH D-D.

W. P. Cass Smith, Government Plant Pathologist.

H. L. Harvey, Assistant Plant Pathologist.

ROOT-KNOT or eelworm-gall is a serious and destructive root attacking disease. It is caused by a parasitic eelworm or nematode (*Heterodera marioni* Cornu, Goodey) which is world-wide in distribution. This parasite is most common and damaging in light soils during the summer months, and in this State it is particularly prevalent in the sandy soils of the Perth metropolitan area and the Geraldton district. This pest may increase costs of production considerably, for it causes a less effective utilisation of applied fertiliser and water and as a result yields are reduced. Unfortunately the root-knot disease may attack a great number of different plants, often widely separated botanically, which considerably increases the difficulty of controlling it by crop rotation. These include most vegetables, fruit trees, and ornamentals and also many pasture plants and common weeds. In general, however, cereals (such as wheat, oats and barley) and grasses are less susceptible to the disease.

SYMPTOMS.

The above-ground symptoms on affected plants include a general unthriftiness, stunting, wilting of the foliage during hot weather, and lack of a healthy green colour. Quite often plants which are wilted during the hotter parts of the day, recover and lose their wilted, limp appearance in the cool of the evening and in the early morning. In bad cases plants may be killed outright especially in the young stages.

If a plant showing the above symptoms is pulled up, numerous galls or swellings will be seen on the roots, from which the disease has received its names. These swellings which are irregular in shape, are the result of infection by the parasite, which causes an enlargement in root diameter. They should not be confused with the beneficial nitrogen-fixing bacterial nodules, which occur normally on the roots of legumes such as peas, beans, lupins, etc. On fleshy underground structures such as the tubers of potatoes and dahlias and the swollen tap-roots of carrots and parsnips, the galls take the form of elevated warts or blisters. It is in these galls that the eelworms and their eggs may be found, but being only microscopic in size they are not visible to the naked eye.

CONTROL BY SOIL DISINFECTION.

As soil in which diseased plants have been grown remains infested for some years, and adequate control by crop rotation is difficult to obtain, control by soil disinfection is sometimes practised. Various agents may be used for this purpose, the most effective being steam, which in addition to killing parasitic organisms, also kills weed seeds and increases soil fertility. Steam treatment is expensive, however, and it has been mainly used on small areas, such as seed-beds or glass-house soils. In consequence, chemical soil treatments have also been tested with varying success, including formalin, carbon-disulphide, crude naphthalene, cresylic acid, etc., and more recently outstanding results have been obtained overseas with a propietary material known as D-D*.

LOCAL TRIALS WITH D-D SOIL FUMIGANT.

During the last twelve months or so, the effectiveness of D-D for eelworm control has been tested under local conditions, at a number of market gardens and home-gardens known to be infested with eelworm. The sites chosen were in the Perth metropolitan or adjacent areas. The D-D and the injection gun used in these trials were kindly supplied by the Shell Company of Australia. In all cases the ground was prepared and treated in accordance with the recommendations set out on pp. 289-290. Although a water seal is said to be unnecessary after D-D injection, this was applied throughout after treatment, as facilities for watering were readily available. No evidence of plant injury resulting from treatment was noticed.

In the earliest trials carried out in autumn 1947, the rate of application was 5 ccs. of D-D, injected in holes eight inches deep at foot centres. (This dosage is equivalent to 580 lbs. per acre or 58 gallons approximately.) In the

* Dichloropropane-dichloropropylene.

Fig. 1.
Roots of red beets. Left, showing various sizes of eelworm galls, was taken from untreated soil. Right, showing better developed roots free from eelworm was taken from adjacent soil which was fumigated with D-D.

following spring and summer of 1947 further trials were conducted using 5 ccs. and 2½ ccs. dosages. Altogther, about 10 sites throughout the metropolitan and nearby areas were treated. In each instance considerable increases in growth were observed, the amount of the increase varying with the degree of eelworm infestation of the soil treated. Autumn treatment in one commercial vegetable garden improved yields at least fifteen-fold with tomatoes, silver beet, red beet and runner beans. Plants in untreated control rows were quite unthrifty and remained stunted to maturity (fig. 2). This particular area had become so badly infested with eelworm that it was no longer profitable for the owner to work it commercially. It is noteworthy that the sugar beet eelworm (*Heterodera schactii* Schmidt) also occurred here, in addition to the root-knot eelworm. On other sites the effect of treatment was less spectacular, but nevertheless effective. Crops grown in the tests included peas, beans, tomatoes, silver beet, red beet, carrots and parsnips.

Fig. 2.
Silver beet and red beet from D-D-treated and untreated soil on the property of Newman Bros., Coogee. The area had gone out of production due to root-knot and sugar beet eelworm infestation of the soil. (a) and (b) silver beet from treated and untreated soil respectively. (c) red beet from untreated soil. (d) red beet from treated soil.

Examinations of roots for the presence of eelworm galls have shown that in most cases plants from treated soil were almost completely free from galls, while those from untreated soil had numerous galls present on their roots. In one or two cases a few plants were found in treated soil with a relatively high proportion of galls on their roots. It is not known for certain whether this was due to fumigation not being completely effective or to later contamination with nearby eelworm-infested soil. The latter seems more probable but the matter is being investigated.

Yield counts and quality gradings were made at some of the experimental sites with the following results (see Tables 1 and 2).

TABLE I.

RESULTS AT GUELPHI AND SONS, OSBORNE PARK.

Amount of D-D per square foot.	Parsnips.		Silver Beet.	Carrots.	
	Yield.	1st Grade Parsnips.	Yield.	Yield.	1st Grade Carrots.
	%	%	%	%	%
Nil	100	33	100	100	62
2½ ccs.	122	67	138	107	84
5 ccs.	118	67	156	107	90

Table II.

RESULTS AT MR. STEVENS, BALCATTA.

Amount of D–D per square foot.	Carrots.	
	Yield. %	1st Grade Carrots. %
Nil	100	33
2½ ccs.	120	59
5 ccs.	120	61

From Table 1 it will be seen that both treatments increased yields of parsnips by about 20 per cent. and of carrots by 7 per cent. The percentage of first grade parsnips was doubled by treatment (fig. 3) while first grade

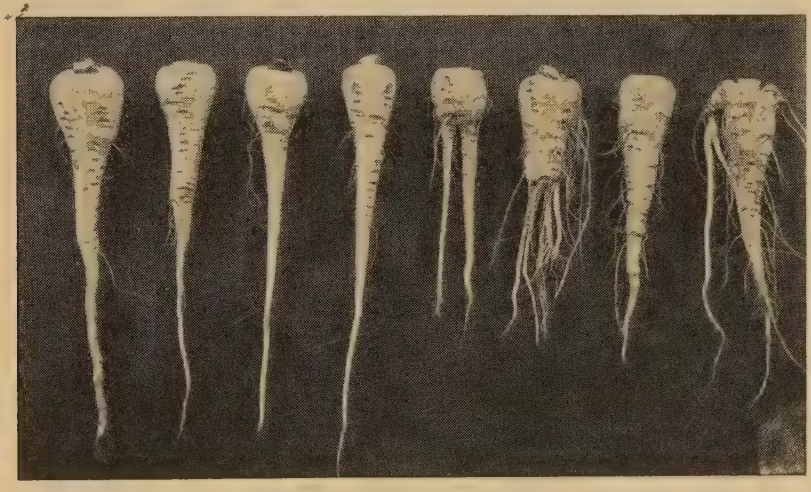


Fig. 3.
Parsnips from plots at Guelphi and Sons Garden. The inferior types on the right are from untreated soil. Those on the left are from soil treated with D-D at 2½ ccs. per square foot. See table 1.

carrots were increased by treatment to about one third to one half as much again as those from untreated plots. Silver beet yields increased by 38 per cent. with the lower dosage and by 56 per cent. with the higher dosage (figs. 4 and 6).

Table 2 shows that both treatments increased yields of carrots by 20 per cent. and doubled the percentage of first grade carrots (fig. 5).

It should be noted in regard to improvement of quality of root crops that inferior grades of carrots for example may be quite unsaleable on a well-supplied market and would, therefore, be a total loss. Carrot prices over the last two or three years have averaged about £20 per ton and at a yield of 10 tons per acre the cash return would be £200 per acre. At the time of writing the price of

Fig. 4.
Silver beet growing at Guelphi and Sons property. Plants in background are on soil treated with D-D at 5 ccs. per square foot. Plants in the foreground are on untreated soil. Yields are shown in Table 1.

Fig. 5.
Carrots grown at Mr. Stevens garden Balcatta. The undesirable types at left were grown on untreated soil. Those at right are from soil treated with D-D.

D-D is 21s. per gallon in 44-gallon lots. At 2½ ccs. per foot the amount used per acre would be approximately 29 gallons costing £30. This illustration serves to indicate the relationship between the cost of D-D and crop returns.

Fig. 6.

Market bunches (9 leaves each) of silver beet from the trial plots grown by Guelphi & Sons. Left, from untreated soil. Right, from soil treated with D-D. In addition to the difference in sizes of the bunches it was possibe to make three picks from the treated plots to every two picks from the untreated plots. Furthermore the picking life of the plants on treated plots was greatly increased.

As a result of the tests conducted to date a number of successful market gardeners have treated areas on a commercial scale in the belief that the increased returns will more than repay the cost of treatment.

In addition to the above examples of control of eelworm by the use of D-D, observations made on growth in small home garden trials serve to support the conclusion that this soil fumigant is an effective means of controlling eelworm. In home-garden soils of the metropolitan area eelworm infestation is often so severe as to make the cultivation of certain vegetables and ornamental plants impossible. Eradication of the pest by D-D fumigation would make the difference between success and failure.

RECOMMENDATIONS FOR THE USE OF D-D.

Preparation of the Soil.

Dig and prepare the ground to be treated so that it is in good condition for sowing or setting out plants. in other words, the ground should be in good tilth, not too wet or too dry. If necessary break down any large clods and allow time (say a fortnight) for residues from previous crops to rot before applying treatment. If this is not done eelworm in large clods or undecomposed root galls may escape the effects of the fumigant.

Application.

D-D obtainable from the Shell Company of Australia or agents, should be applied in holes six to eight inches deep and spaced one foot apart in staggered rows (i.e., the holes in one row should be opposite the spaces between holes in the adjoining rows).

A dosage of 2½ cubic centimetres or ½ teaspoonful of D-D per hole is adequate, at which rate approximately 160 square feet can be treated with one

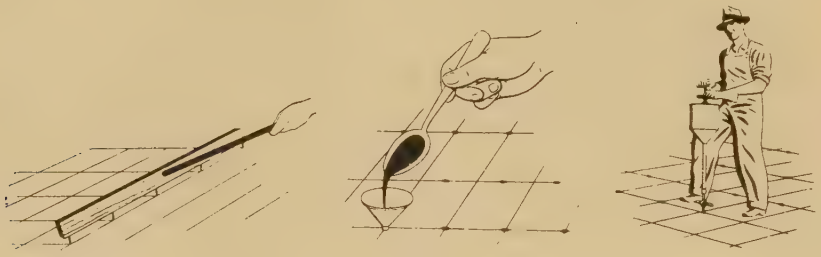


Fig. 7.

Illustration showing a convenient method of marking soil into squares prior to treatment, and two methods of injecting D-D into the soil. The teaspoon method has been practised with success by home-gardeners, and the injection gun on right is suitable for larger areas and is similar to that used in these experiments. Note that the injection centres are staggered which gives more uniform distribution of the gas throughout the soil.

(Reproduced by courtesy of the Shell Co. of Australia).

half pint of fumigant. Pour the liquid into the *bottom* of each hole (a funnel will facilitate this) and cover immediately with soil to prevent the fumes escaping too rapidly. Plastic teaspoons of accurate size are now available at many stores. For large areas a soil injection gun* is more suitable than the teaspoon method of application.

After Treatment.

If possible water the ground after application so that the surface two inches are moistened. This will prevent fumes from escaping too rapidly. Dig the ground over a fortnight after the treatment has been applied to allow the fumes to escape and plant three weeks after the initial treatment.

Precautions.

D-D should not be applied within 30 inches of growing plants whether herbaceous annuals or perennials, or woody trees or shrubs.

Avoid breathing the fumes of D-D unnecessarily, and *do not* siphon the liquid by mouth suction.

If splashed on the hands wash off with soap and water, to avoid the risk of skin inflammation. Susceptibility to this, however, varies greatly with different individuals, most being practically immune.

* Application should be made direct to the Shell Company of Australia for soil injection guns.

AUTUMN RAINFALL IN RELATION TO SPRING EPIDEMICS OF WHEAT STEM RUST.

A Note on the Occurrence of a Localised Outbreak.

By W. P. Cass Smith, Government Plant Pathologist.

IN Western Australia ideal weather conditions in spring or early summer for the development of wheat stem rust seldom occur for lengthy periods, and in consequence serious epidemics have been infrequent. During the last forty years, only four widespread epidemics have been recorded in the main wheatbelt areas, namely in 1915, 1917, 1934 and 1943.

Attention has been drawn previously to an apparently significant relationship between autumn rainfall and the occurrence of rust epidemics subsequently in spring or early summer (Cass Smith and Millington, 1944).

It was pointed out that these rust epidemic years were characterised by unusually heavy rainfall between January and April, and especially in March, and as far as existing records showed, rust epidemics had *only* occurred in Western Australia in years such as these.

To explain this phenomenon it was postulated that in such years an autumn build-up of rust occurs on barley grass, self-sown or early sown wheat, which survives the winter, and which more readily enables the disease to attain epidemic amounts in spring or early summer, should favourable weather for its development occur.

Thus, with a short period only of favourable spring weather, which is generally the case in the Western Australian wheatbelt, the disease is most likely to reach epidemic proportions where an autumn build-up and winter carry-over of rust has occurred. There is evidence to support this theory. Infection by the stem rust fungus proceeds most freely, and its growth develops most rapidly at temperatures between 65° and 75°F. (Craigie 1940). In our wheatbelt areas mean daily temperatures within this range commonly occur during the autumn months. At this period, moisture, an absolute requirement for rust infection, is apparently the chief limiting factor both for rust development and also for the growth of susceptible host plants.

In years of unusually heavy autumn rainfall, rust has often been noted on self-sown wheat, and barley grass, which soon appear in many areas and make luxuriant growth under these conditions. The survival of the fungus throughout the winter months has also been observed in the rust gardens at the Merredin and Wongan Hills Research Stations where autumn infected wheat plants again produce uredospores abundantly in spring.

However, as rust epidemics recorded in the past have been more or less widespread and as detailed field observations have not yet been possible, it has been difficult to establish more definitely this suspected relationship between autumn rainfall and rust development in spring.

During the 1947 season circumstantial evidence strongly supporting this belief was obtained when, in the Wongoondy area, following a very local thunderstorm of 235 points in March, a severe rust epidemic occurred in spring, which was practically confined to the two farms which experienced the rain storm. The average March rainfall for this area is some 80 points and elsewhere in this district only approximately average precipitations were received.

In an interesting report on this epidemic, dated 11/10/47, Agricultural Adviser G. L. Throssell stated . . . . . "Following on reports of a rust epidemic at Wongoondy, I visited the area on the 8th and 9th of October. Unlike the epidemic of 1943 when practically the whole area was devastated, this year rust in severe form seems to be practically confined to two farms. These farms received a localised thunderstorm in March of 235 point of rain, which other farms did not get. This brought up a prolific growth of self-sown wheat, which was 12 inches high in May and obviously rusted. These two farms have been badly hit, and crops of Bencubbin totalling 600 acres have been practically wiped out. Bungulla, 400 acres, will be much reduced in yield. Rust does occur on other adjacent farms, but the infection is much less, and I don't anticipate there will be much reduction in yield as a result."

Rainfall recorded at one of the affected farms was as follows:—

RAINFALL.

H. B. MILLS, Wongoondy, 1947.

Jan.	Feb.	Mar.	Apl.	Growing Period.							Nov.	Dec.	Total.
				May.	June.	July.	Aug.	Sept.	Oct.	Total. May-Oct.			
....	....	235	96	658	266	325	126	127	260	1,762	15*	....	2,108

* To 19th November.

As far as can be ascertained, spring weather conditions were no more favourable for rust development at these two farms than elsewhere in the near vicinity, yet they were the only farms in the area where rust developed to epidemic amounts.

The occurrence of the Wongoondy outbreak therefore strongly supports the belief that under Western Australian conditions, heavy autumn rainfall which is conducive to an autumn build-up of rust, increases the chances of an epidemic later in spring or early summer.

In view of this it has been suggested that in such years a warning of high rust hazard could be issued to farmers prior to seeding, to enable them to plant rust resistant varieties. However, until long-range weather forecasts are available it is impossible to predict with accuracy how rust development will proceed in spring or early summer.

It should be clearly understood that if weather conditions at that time are unfavourable for rust development, no epidemic will occur, despite an autumn build-up of inoculum. A study of records will show that there have been a number of years of unusually high autumn rainfall which presumably were favourable for a build-up of rust but in which no epidemic occurred. On the

other hand it cannot be affirmed with any confidence that weather conditions will never remain favourable long enough in spring, to preclude the possibility of an epidemic in years of low autumn rainfall, even though there has so far been no record of such an occurrence.

LITERATURE CITED.

Cass Smith, W. P., and Millington, A. J.: "Stem Rust of Wheat and its Control by Breeding Resistant Varieties." J. Dept. Agric. West. Aus., Vol. XXI. (2nd Ser.), March, 1944, pp. 1-16.

Craigie, J. H.: "Studies in Cereal Diseases. XII. Stem Rust of Cereals." Fmrs. Bull. Canad. Dept. Agric. 84.

SOIL CONSERVATION METHODS FOR CONTROL OF WIND EROSION.

A Broadcast by G. H. Burvill, Commissioner of Soil Conservation.

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MOVING masses of air, which we commonly call wind, have considerable energy. This energy is often harnessed for man's use by means of windmills or by the sails of boats, but the uncontrolled forces of violent windstorms can, and do cause considerable damage to property from time to time. Soil erosion is often part of the damage. Thus, controlling the force which the winds can exert on the soil is one of the essential tasks in soil conservation.

Wind erosion of the soils in the agricultural and pastoral areas of Western Australia is common and perhaps extensive but, fortunately, not often very severe. It should, however, receive careful attention from landholders with affected areas (see Fig. 1).

Most of our farmlands showed no signs of active wind erosion before clearing. The scrub and trees and grass were a natural protection for the surface soil. In the same way, the establishment and maintenance of plant cover, either living or dead, constitutes the first line of attack on wind eroding areas, and the first line of defence to prevent wind erosion.

Before passing on to practical recommendations some important facts about soil movement by wind should be understood. The amount of soil erosion by wind depends mainly on the velocity and turbulence of the wind, the roughness and cover on the ground surface, and the type of soil. The general velocity of the wind over an area, and the type of soil, are mostly outside man's control. But by suitable attention to the roughness and cover on the surface, the wind velocity and turbulence near the ground can be managed to prevent soil movement.

The speed of any wind is less, close to the ground, than, say, one or two feet above it. If it can be sufficiently reduced by ridging, or by surface cover, then the wind force is insufficient to *begin* moving soil particles. Experiments

Fig. 1.

Aerial view of 160 acres of bare wind-eroded yellow sandy soil in the wheatbelt. Fences and the road in the lower portion of the picture have been buried and the drift extends on to the adjoining farm. Cereal rye was grown successfully over the whole area in 1948.

(Photo.: Kingsley Watson.)

have shown that sand grains, and the coarser soil particles, commence their movement by rolling, then suddenly jump upwards a foot or two. After this they move forward and downwards with the wind and dislodge other and *smaller* particles when they strike the surface again. The series of leaps and forward moves is called *saltation*. The whole basis of wind erosion control is to prevent or reduce saltation.

Dust clouds are composed of particles which remain suspended in the air for a long time. Most of the particles are less than four-thousandths of an inch in size. Yet such particles are not easily shifted from the ground by wind unless first dislodged by other larger grains, or by traffic or animals. Dust clouds from loamy and clay soils undoubtedly mean that some soil erosion is occurring.

but it is usually on sandy soils in this State that the more worrying type of wind erosion occurs. Surface soil removed means lowered fertility, but in addition, its accumulation in other places buries fences, roads, railways and channels. In Victoria hundreds of thousands of pounds have had to be spent each year to remove drift sand from channels which supply stock and domestic water to the Mallee areas. In South Australia, too, the control of sand drift on to roads and railways in the Mallee areas is a major task (see Fig. 2).

Fig. 2.
In the Mallee areas of South Australia and Victoria, sand drift, as shown, has become a serious problem.
(Photo.: International Harvester Co.)

It is apparent that keeping a reasonable cover of living or dead herbage on the soil surface is the best insurance against wind erosion. This means avoiding overgrazing and improving of pasture cover by topdressing and by growing the most suitable pasture plants for the soil and climatic conditions of the locality. For the sandy soils of the scrub plain and mallee areas, subterranean clover, lupins, Wimmera rye grass and oats appear at present most suitable.

If sandy or light soils are fallowed they should be left rough and with ridges if possible, across the direction of the most common strong winds. Fallowing should not be done on areas that have already shown a definite tendency to drift when bare, unless a special effort is made to protect the surface with straw or trash (see Fig. 3). In the Victorian Mallee a common practice is to scratch in oats for grazing in the fallow year, and to do the fallowing late in the season so that the remains of the oat crop help to protect the surface and produce a "bearded" or "trashy" fallow. Choice of implement and speed of working can be important. Some disc ploughs leave too smooth a surface if worked too fast. Scarifiers ridge the ground and do not bury all the weeds or stubble and may therefore be used with advantage.

Fig. 3.

When sandy surfaced soils are cultivated for crops special methods may be necessary. These pictures from sandy scrub plain land show:—Left: Remains of grazed scratched in oat crop. Middle: Similar grazed oat crop scarified in October to leave ridged trashy surface. Right: Normal fallow, disc ploughed in July, leaving an almost bare surface which blows flat and erodes.

(Photos: G. H. Burvill.)

Where serious wind erosion has already occurred, leaving scoured areas in places and mounds of drifted soil in others, special measures are necessary to achieve control. Cereal rye has proved a suitable crop for drifting sands because of its ability in the seedling stage to recover from the sand blasting which usually occurs (see Fig. 4). Added advantages which rye has, are its capacity for growth on poor soils and its tough straw when mature. There are many bare eroding areas of varying size among the sandy scrub plain areas of the wheat-belt which could be stabilised and reclaimed with rye, followed perhaps later by subterranean clover where the rainfall is sufficient. Cereal rye should be planted at 30 to 50 pounds per acre with eighty to one hundred pounds of

Fig. 4.
Cereal rye is a hardy crop for poor soils and drifting sands. Its seedlings withstand sand blast much better than wheat, oats, or barley.
(Photo.: Government Printer.)

superphosphate. A disc drill used when the sand is moist after rain allows rather loose drifts to be sown. No grazing should be allowed in the year of planting. Some sandy areas where erosion was troublesome have also been stabilised with West Australian blue lupins, planted originally with a cereal (see Fig. 5).

No discussion of wind erosion would be complete without mention of wind-breaks and shelter belts. There is a common belief that the planting or leaving of belts of scrub or trees at fairly wide intervals across the countryside would control wind erosion. Such belts of scrub or timber have great value as wind-breaks and shelter for stock, homes and sheds. Their effect in reducing wind velocity close to the ground is limited, and may not extend beyond a distance five to ten times the height of the scrub or trees. Belts of scrub, mallee, or timber one to five chains wide are worth serious consideration for protecting roads and fences from drifting soil, and as shelter and shade for stock (see Fig. 6).

Fig. 5.

Thin stand of barley and oats with scattered W.A. blue lupins on an area at Irwin from which at least a foot of soil had blown. Even a sparse plant cover can stop wind erosion.

(Photo.: L. J. H. Teakle.)

Fig. 6.

Belts of scrub and mallee along boundaries and fences can provide shelter for stock and protect fences and roads from any drift which occurs. In this picture drift sand from the cleared area to the left has formed mounds extending about half a chain into the natural scrub.

(Photo.: G. H. Burvill.)

The protection of broad areas of crop and pasture lands from wind erosion must, however, depend on careful management in the pasture periods and suitable methods of cultivation when crops are grown.

In the interests of soil conservation, and to prevent damaging erosion which might occur, a number of Road Boards and farmers' organisations are quite keen to see legislative control of land clearing. This applies especially to our sandy scrub plain lands in the wheatbelt, on which examples of sand drifts menacing, or covering, fences and roads are all too common (see Fig. 1).

Stock Foods.

Stock Food.	Reg. No.	Brand.	By whom Registered.	Materials from which Made.	Registered Analysis.							
					Crude Protein.	Crude Fat.	Crude Fibre.	Sodium Chloride.	Phos. Acid (P_2O_5)	Lime.	Other.	
					% (Min.)	% (Max.)	% (Max.)	% (Max.)	% (Max.)	% Ca		
A.—SIMPLE FOODS.												
1.—*Meat Meals.*												
Meat Meal	31	WRIGHTS	Wrights, Ltd.	Animal fat and bone	40·00	11·00	1·50	....	14·00	....	....	....
Do.	52	W.A.M.E.	W.A. Meat Export Works	Meat, bone and blood	45·00	13·00	2·00	....	...	....	....	....
Do.	110	W.A.M.E., ALBANY	W.A. Meat Export Works, Albany	Animal offal	53·00	20·00	3·00	....	....	....	....	....
Do.	141	COOGEE	Anchorage Butchers Pty.. Ltd.	Waste meat products	36·90	18·60	1·30	1·00	12·73	11·43	....	....
2.—*Meat and Bone Meals.*												
Feeding Meal and Bone Meal	54	CHAMPION	Sims Cooper (Freezing Works) Pty., Ltd.	Meat Works offal	50·00	12·00	5·00	....	....	....	....	....
Meat and Bone Meal	29	PENNELLS	C. A. Kirkby & Sons	Animal waste	50·00	12·00	4·00	....	....	....	....	....
Bone and Meat Meal	47	KITCHEN'S	J. Kitchen & Sons Pty., Ltd.	Animal fat and bone	40·00	11·00	2·50	....	14·00	....	....	....
Fortified Protein Meal	55	IMPERIAL	W. Angliss & Co. (Aust.), Pty., Ltd.	Meat, bone, livers, and animal offal	50·00	12·00	2·00	....	....	....	....	....
Meat and Bone Meal	101	EXCELSIOR....	Barrow Linton & Co.	Meat and bone	38·00	15·00	1·50	....	....	....	....	....
Do. do.	81	S.M.P.	W. R. & N. N. Clarke	Meat offals	50·00	13·00	2·00	....	....	....	....	....
Bone and Meat Meal	146	APOLLO	J. Kitchen & Sons Pty., Ltd.	Animal fat and bone	40·00	11·00	2·50	....	14·00	....	....	....
3.—*Fish Meals.*												
Crayfish Meal	1	CHAMPION BAY	Logie Sons & Duncan	Crayfish offal	27·50	2·50	8·00	....	....	....	....	....
Fish Meal	109	W.A.M.E. ALBANY	W.A. Meat Export Works, Albany	Fish wastes and offals	53·00	10·00	1·00	....	6·11	5·90	....	....
4.—*Milk Foods.*						(Min.)						
Dried Buttermilk Powder	25	SUNNY WEST	South-West Co-op. Dairy Farmers, Ltd.	By-products of butter manufacture	32·10	5·70	....	....	....	....	....	....
Krafco	50	KRAFCO	Kraft Walker Cheese Co. Pty., Ltd.	Prepared from whey derived from milk in cheddar cheese manufacture	10·00	0·50	....	....	1·00	0·50	Lactose 68·00	Riboflavin 25 u/gm
Lactocraft	56	LACTOCRAFT	do. do. do.	do. do. do.	10·00	0·50	....	....	1·00	0·50	68·00	25 u/gm.
Buttermilk Powder	82	SOUTH AUSTRALIAN FARMERS UNION	W. R. & N. N. Clarke	Butter milk	41·00	6·00	....	....	....	....	40·00	....

5.—*Wheat By-Products.*												
Wheaten Meal	44	BRANATO	W. Thomas & Co. (W.A.), Ltd.	Wheat	8·00	....	9·00	....	....	....	....	....
Do.	45	POLLATO	do. do. do.	do.	8·00	....	9·00	....	....	....	....	....
Do.	46	"C" MEAL	do. do. do.	do.	8·00	....	9·00	....	....	....	....	....
Wheat Meal	70	MILLERS	W. H. Milne & Co.	do.	8·00	....	5·00	....	....	....	....	....
Sub-bran	71	do.	do. do. do.	do.	8·00	....	9·00	....	....	....	....	....
Stock Meal	72	do.	do. do. do.	do.	8·00	....	5·00	....	....	....	....	....
Wheat Meal	133	WESFARMERS	Westralian Farmers Co-op., Ltd.	do.	8·50	1·00	3·00	....	....	....	....	....
Roller Bran	134	do.	do. do. do.	do.	8·50	....	9·00	....	....	....	....	....
6.—*Oil Seed* Meals.												
Pure Linseed Oil Meal	51	MEGGITTS	Elder Smith & Co., Ltd.	Pure linseed from which proportion of the oil content has been extracted	30·00	4·00	10·00	....	....	....	....	....
Lin Meal	61	WESTERN	David Gray & Co. Pty., Ltd.	Linseed meal, yeast meal, bone meal, limestone. malt	22·50	7·00	5·00	....	....	0·50	....	....
B.—COMPOUND FOODS.												
1.—*Protein Meals.*												
Quicklay	16	THOMAS	W. Thomas & Co. (W.A.), Ltd.	Yeast, fish meal, meat meal, liver meal, and/or dried blood, milk powder, pollard, salt, ground limestone	35·00	(Max.) 12·50	4·00	3·00	....	15·00	.. .	....
Egg Protein	22	do.	do. do. do.	Fish meal, meat meal, and/or blood meal, liver meal, milk powder, salt, ground limestone	42·00	15·00	4·50	8·50	....	15·00	....	....
Quickgrow	23	do.	do. do. do.	Meat meal, blood meal, salt ground limestone, pollard	25·00	19·00	2·60	2·75	....	15·00	....	....
Poultry Pusher	33	PANNIFEX	Wrights, Ltd.	Barley, oats and rice brannings, pollard, bols refuse, bran, flax, linseed, wheat polishings, meat meal, rape seed meal, blood meal	32·00	(Min.) 7·00	8·00	....	....	Trace	....	....
Egg Food	60	WESTERN	David Gray & Co. Pty., Ltd.	Meat meal, blood meal, liver meal, linseed meal, bone meal, yeast meal, malt	30·00	10·00	4·00	....	....	0·50	....	....
Eggoleen	102	EGGOLEEN	Barrow, Linton & Co.....	Meat meal, cereals and minerals	37·50	(Max.) 12·00	1·50	....	....	....	....	....
Protein Meal "A"	127	WESFARMERS	Westralian Farmers Co-op., Ltd.	Meat meal, salt, manganese, butter milk, maize meal, fish meal, ground limestone	35·00	10·00	4·00	2·00	....	2·50	Manganese Trace	....
Protein Meal "B"	128	do.	do. do. do.	Meat meal, liver meal (when available), bone meal, fish meal, ground limestone	35·00	10·00	4·50	....	....	5·00	....	....
2.—*Cattle Foods.*												
Sweet Dairy Food	10	THOMAS	W. Thomas & Co. (W.A.), Ltd.	Bran, pollard, wheaten meals, wheat germ, salt, ground limestone, malt combings, and/or gristed linseed (bone meal if available), milk powder, molasses	11·50	(Min.) 1·50	8·50	1·75	....	4·00	....	....

Stock Food.	Reg. No.	Brand.	By whom Registered.	Materials from which Made.	Registered Analysis.							
					Crude Protein.	Crude Fat.	Crude Fibre.	Sodium Chloride.	Phos. Acid (P_2O_5)	Lime.	Other.	
					% (Min.)	% (Max.)	% (Max.)	% (Max.)	%	% Ca	%	%
Sweet Cow Food	11	THOMAS	W. Thomas & Co. (W.A.), Ltd.	Bran, wheaten meal, mill screenings, malt combings, and/or gristed linseed, molasses, salt ground limestone	9·00	1·50	15·00	1·50	....	4·00	....	....
Mormilk No. 2	32	PANNIFEX	Wrights, Ltd.	Flax, linseed, bols refuse, wheat polishings, oat pollard, rape seed meal, rice meal, meat and bone meal, bone meal	20·00	4·75	14·00	Trace	Trace	Trace	....	....
Milk Food	62	WESTERN	David Gray & Co. Pty., Ltd.	Linseed meal, peanut meal, yeast, bone meal, oat meal, limestone	22·50	7·00	5·00	....	....	0·50	....	....
Sweet Dairy Food	64	do.	do. do. do.	Malt combings, yeast, oat meal, wheat meal, mill offal, limestone, linseed, salt	12·00	3·00	10·00	....	....	0·50	....	....
Cattle Food	99	EVELYN	Tropical Traders, Ltd.....	Linseed (whole and meal), pollard, salt, limestone, chalk, molasses, sulphur, medicinal herbs, minerals	6·50	5·40	14·00	6·00	5·50	6·00	(Max.) Sulphur 3·50	....
Cow Food	103	DAISY FOOD	Barrow, Linton & Co. ...	Wheat, oats, barley, pea meal	9·00	2·50	4·00	....	....	....	....	....
Sweetened Dairy Meal	131	WESFARMERS	Westralian Farmers Co-op., Ltd.	Wheat meal, bran, oat meal, linseed meal, clover, pollard, molasses, bone meal, ground limestone, salt, bluestone	11·00	2·50	6·00	1·00	....	0·70	Cu. ·003	....
3.—*Calf Foods.*												
Calf Milk	20	THOMAS	W. Thomas & Co. (W.A.), Ltd.	Butter milk powder, maize meal, pollard, salt, ground limestone	13·50	2·50	6·00	1·25	....	10·00	....	....
Calf Food	21	do.	do. do. do.	Linseed meal, pollard, and/or maize meal, salt, ground limestone	15·50	2·50	6·50	3·00	....	15·00	....	....
Do.	30	PARSONS	Parsons Bros. & Co. Pty., Ltd.	Wheat, oat brannings, inseed, limestone, salt	12·00	2·00	6·00	1·00	....	....	....	....
Do.	48	HARPERS STAR	R. Harper & Co., Ltd.	Oats, linseed, maize, barley, rice meal, condiments	11·50	12·00	7·00	....	....	....	....	....
Do.	63	WESTERN	David Gray & Co. Pty., Ltd.	Linseed meal, oat meal, peanut meal, powdered milk, yeast, bone meals, minerals	22·50	7·00	5·00	....	2·00	0·50	....	....
Kaf-o-vite	83	KAF-O-VITE....	Goldsbrough Mort & Co. Ltd.	Rice meal, barley meal, wheat, pollard, linseed meal, bone charcoal, limestone, cane sugar, essence of aniseed	16·50	10·50	7·50	....	0·80	1·50	....	....

Calf Food	97	EVELYN	Tropical Traders, Ltd.....	Wheat, pollard, linseed whole, salt, sugar, chalk, medicinal herbs, minerals	10·50	4·77	3·86	3·00	....	0·75	....	....
Do.	112	VETAMAC	A. H. McDonald & Co.	Wheat, pollard, maize meal, linseed meal, milk, sugar, mutton bird oil	15.3½	7.50	1.50	....	....	....	....	....
Calf Meal	132	WESFARMERS	Westralian Farmers Co-op., Ltd.	(Wheat, maize and barley meals), bran, butter milk, whey powder, linseed meal, ground limestone, bone meal, salt, copper sulphate	13.00	3.50	6.00	Less than 1.00	....	0.50	....	....
4.—*Sheep Foods.*												
Maintenance Sheep Nuts	65	WESTERN	David Gray & Co. Pty., Ltd.	Linseed meal, yeast meal, limestone, bone meal, salt, minerals	15.00	3.00	7.00	....	....	0.50	..	....
Ewe and Lamb Nuts	66	do. ..	do. do. do.	Linseed meal, yeast meal, bone meal, malt, wheat germ, bone meal, salt, minerals	22.50	7.00	5.00	....	....	0.50	.... (Max.) Sulphur 3.80	....
Sheep Food	100	EVELYN	Tropical Traders, Ltd. ..	Linseed (meal and whole), pollard, salt, limestone, chalk, sulphur, medicinal herbs, minerals	6.50	5.90	14.80	6.00	4.00	7.25		....
Sheep Maintenance Cubes	135	WESFARMERS	Westralian Farmers Co-op., Ltd.	(Oat, wheat, barley, linseed, peanut, and cocoanut meals), clover, pollard, bone meal, molasses, salt ground limestone and minerals.	14.00	3.00	7.50	Less than 1.00	....	0.70	....	....
Sheep Breeder Cubes	136	do.	do. do. do.	Same as above.	18.00	3.00	7.50	0.50	....	0.70	....	....
5.—*Poultry Foods.*												
Special Laying Mash	2	THOMAS	W. Thomas & Co. (W.A.), Ltd.	Bran, pollard, wheaten meal, and/or oat meal, liver meal, salt, ground limestone	13.50	3.00	7.50	1.50	..	3.75	....	....
Laying Mash No. 1	3	do.	do. do. do.	Bran, pollard, wheaten meal, and/or oat meal, wheat germ, meat meal, milk powder, yeast, salt, ground limestone	14.00	2.50	6.00	1.50	....	3.75	....	....
Laying Mash No. 2	4	do. .	do. do. do.	Bran, pollard, wheaten meal, and/or oaten meal, wheat germ, bone meal, pea meal, and/or milk powder, salt, ground limestone	11.00	2.50	6.50	1.50	....	3.75	....	....
Fattening Mash	5	do. ..	do. do. do.	Bran, pollard, wheaten meals, and/or oat meal, wheat germ, maize meal, milk powder, salt, limestone	10.00	2.00	6.50	1.25	....	3.75	....	....
Poultry Mash	28	K.B.	C. A. Kirkby & Sons	Wheat, bone, salt, bran, pollard, ribonflavin, cocoanut meal	13.00	3.45	7.00	1.00	1.21	2.00	....	....

Stock Food.	Reg. No.	Brand.	By whom Registered.	Materials from which Made.	Registered Analysis.							
					Crude Protein.	Crude Fat.	Crude Fibre.	Sodium Chloride.	Phos. Acid (P_2O_5)	Lime.	Others.	
					% (Min.)	% (Min.)	% (Max.)	% (Max.)	%	% Ca.	%	%
Eggmilk	17	THOMAS	W. Thomas & Co. (W.A.), Ltd.	Butter milk powder, milk powder, pollard, salt, ground limestone	15.00	5.00	4.00	3.00	..	15.00	.	.
A1 Laying Mash ..	58	WESTERN ...	David Gray & Co. Pty., Ltd.	Bran, pollard, wheat meal, meat meal, bone meal, linseed meal, yeast, limestone	14.00	3.00	5.00	2.00		0.50	.	
Laying Mash " B "	59	do. ...	do. do. do.	Same as (58) less meat meal .	12.50	3.00	5.00	2.00		0.50	.	..
Laying Mash No. 1	69	MILLERS ...	W. H. Milne & Co.	Bran, pollard, wheat meal, gristed oats, meat meal, bone meal, limestone, salt	14.00	4.00	5.50	1.50	2.00	3.00	.	.
Laying Mash .	73	MORLAY	R. B. Young	Wheat meal, bran, pollard, meat meal, bone meal, limestone, minerals	14.00	3.00	5.50	1.50	3.50	2.50	....	..
Growing Mash	74	do.	do. do.	Same as (73) plus milk powder when available	12.50	3.0	5.50	1.50	4.00	2.50		
Laying Allmash ...	75	do. .	do. do.	Same ingredients as (73) ..	13.00	3.00	6.00	1.5	4.00	2.50	....	.
Growing Allmash .	76	do.	do. do.	Same as (75) plus ribon	12.00	3.00	6.00	1.5	4.00	2.50	..	.
Laying Mash " B "	79	do. .	do. do.	Wheat meal, bran, pollard, bone meal, limestone, minerals	11.50	3.00	6.00	1.5	4.00	2.00	....	.
" D " Mash (Fattening)	80	do.	do. do.	Wheat meal, bran, pollard, bone meal, minerals	10.50	3.00	5.00	1.50	3.50	2.00	..	..
Fattening Mash ...	106	DUKKO	Barrow, Linton & Co. ..	Bran, pollard, wheat meal, oat pollard, bone meal, salt, limestone	10.00	4.00	4.00	1.00	...	3.00	....	..
Laying Mash	107	EGGLAYER .	do. do. do.	Same as (106) plus meat meal, and less bone meal	14.00	3.50	4.50	1.00	....	3.00	....	...
Growing Mash ...	108	GROWELL .	do. do. do.	Same as (107) plus wheat germ	14.00	4.50	4.50	1.00	..	3.00	...	..
Growers Mash	119	WESFARMERS	Westralian Farmers Co-op., Ltd.	Meat meal, wheat meal, pollard, oat meal, bran, butter milk, salt, limestone	13.00	4.00	7.50	0.50	...	0.70	...	.
Laying Mash No. 1	120	do.	do. do. do.	Same as (119) plus whey powder	14.00	4.00	7.00	0.50	....	1.00	..	..
Laying Mash No. 2	121	do.	do. do. do.	Same as (120) less meat meal	11.00	3.00	7.00	0.50	....	0.80	...	....
Growers Pellets	124	RED COMB .	do. do. do.	Same as (119) plus fish meal when available	13.00	4.00	7.50	0.50	....	0.70	...	....
Laying Pellets No. 1	125	do.	do. do. do.	Same as (120) plus fish meal when available	14.00	4.00	7.00	0.50	....	0.80	....	....
Laying Pellets No. 2	126	do.	do. do. do.	Same as (121)	11.00	3.00	7.00	0.50	....	0.80	....	....
Poultry Fattening Mash	129	WESFARMERS	do. do. do.	Barley meal, wheat meal, pollard, oat meal, bran, butter milk, fish meal, salt, ground limestone	10.00	2.50	6.00	0.50	....	0.70	....	....
Poultry Fattening Pellets	130	RED COMB	do. do. do.	Same as (129)	10.00	2.50	6.00	....	....	0.70	...	....

6.—*Chick Foods.*

Chick Starter	6	THOMAS	W. Thomas & Co. (W.A.), Ltd.	Bran, pollard, wheaten and/or oaten meal, wheat germ, meat meal, milk powder, maize meal, lucerne pollard, crayfish meal, cod liver oil, salt, limestone	14.50	2.50	6.00	1.25	....	3.75	....	....
Chick Starter No. 2	7	do. ...	do. do. do.	Same as (6) less meat and crayfish meals	11.00	1.50	6.00	1.25	....	3.75	....	....
Chickgrower	8	do.	do. do. do.	Same as (6) less cod liver oil and crayfish meal	13.50	2.50	6.00	1.25	....	3.75	....	....
Chickgrower No. 2	9	do.	do. do. do.	Same as (8) less meat meal	11.00	1.50	6.00	1.25	....	3.75	....	....
Chickengrain	14	do.	do. do. do.	Maize, wheat, peas, shellgrit, kalo corn	9.00	1.50	4.50	....	....	....	....	....
Chicken Milk No. 1	18	do.	do. do. do.	Milk powder, meat meal, liver meal, fish meal, bone meal, pollard, salt, limestone	20.50	1.50	4.00	3.00	....	15.00	....	....
Chicken Milk No. 2	19	do.	do. do. do.	Butter milk powder, bone meal, pollard, salt, limestone	18.00	1.50	4.00	3.00	....	15.00	....	....
Chickfood	27	W.A.P. APEX	W.A. Produce Co.	Wheat, maize, peas, oats, grit	10.00	3.00	6.50	....	....	....	....	....
Do.	49	H & C	Haynes & Clements	Wheat, maize, peas, grit, kalo corn	9.00	1.50	4.50	....	....	3.00	....	....
Chickstarter	145	WESTERN	David Gray & Co. Pty., Ltd.	Pollard, bran, maize meal, meat meal, wheat meal, yeast, wheat germ, butter milk, bone meal, cod liver oil	14.50	4.00	4.50	....	2.00	0.50	....	....
Chickbuilder	57	do.	do. do. do.	Same as (145) less wheat meal	14.00	4.00	4.50	..	2.00	0.50	....	....
Do.	67	MILLER	W. H. Milne & Co.	Bran, pollard, wheat meal, cod liver oil, maize meal, gristed oats, salt, whey powder, oyster flour	15.00	4.00	5.50	12·50	2.00	2.50	....	....
Chickstarter	68	do.	do. do. do.	Same as (67), except oat meal in place of gristed oats	15.00	4.00	5.50	1.00	2.00	2.50	....	....
Do.	77	MORLAY ..	R. B. Young	Wheat meal, bran, maize meal, meat meal, milk powder, bone meal vitaminised oil, gristed oyster shell grit, minerals	15.00	3.00	5.50	1.50	3.50	2.50	....	....
Chick Allmash	78	do.	do.	Same as (77), except ribon in place of vitimanised oil	12.50	3.00	5.50	1.50	3.50	2.00	....	....
Chickstarter	104	VITALIZER	Barrow, Linton & Co. ...	Bran, pollard, wheat meal, oat pollard, wheat germ, meat meal, milk powder, salt, gristed limestone, oil	15.00	4.00	4.50	1.00	....	3.00	....	....
Chick Grain	105	CHIC CHIC	do. do. do.	Wheat, oats, maize, peas ...	9.00	2.70	5.00	....	..	..	....	....
Chicken Mash	116	ROYAL SEAL	J. & W. Bateman	Pollard, bran, maize meal, oat meal, powdered milk, bone meal, meat meal	10.00	2.00	4.00	....	..	....	....	....
Chicken Meal	115	do.	do. do.	Wheat, pannicum seed, peas, maize, shell grit	10.00	2.00	4.00	....	....	..	..	....
Chick Mash "A"	117	WESFARMERS	Westralian Farmers Co-op., Ltd.	Meat meal, liver meal, maize meal, ground limestone, salt, wheat meal, oaten meal, bran, pollard, butter milk, manganese sulphate, vitaminised fish oil	15.00	4.00	7.00	Trace	..	0.30	....	....

Stock Food.	Reg. No.	Brand.	By whom Registered.	Materials from which Made.	Registered Analysis.							
					Crude Protein.	Crude Fat.	Crude Fibre.	Sodium Chloride.	Phos. Acid (P_2O_5)	Lime.	Other.	
					% (Min.)	% (Max.)	% (Max.)	% (Max.)	% (Max.)	% Ca.	%	%
Chick Mash " B "	118	WESFARMERS	Westralian Farmers Co-op., Ltd	Meat meal, ground limestone, vitaminised fish oil, wheat meal, oaten meal, pollard, bran, butter milk, salt	14.00	4.00	7.00	0.50	....	0.50	....	....
Chick Pellets " A "	122	RED COMB	do. do. do.	Same as (117)	15.00	4.00	7.00	Trace	....	0.30	....	....
Chick Pellets " B "	123	do.	do. do. do.	Same as (118)	14.00	4.00	7.00	0.50	....	0.50	....	....
7.—Pig Foods.												
Pig Starter	12	THOMAS	W. Thomas & Co. (W.A.), Ltd.	Pollards, pea meal, meat meal, wheaten meal, salt, gristed limestone	13.00	1.50	6.00	1.25	....	3.75	.... (Max.) Sulphur	....
Pig Grower	13	do.	do. do. do.	Pollard, wheat meal, bone meal, milk powder, salt, ground limestone	12.00	1.50	6.00	1.25	....	3.75	....	....
Pig Food	98	EVELYN	Tropical Traders, Ltd. ...	Pollard, linseed (meal and whole), limestone, chalk, sulphur, minerals, and medicinal herbs	8.00	10.50	12.35	3.00	4.40	6.80	3.80	....
8.—Horse Foods.												
Sweet Horse Foods	15	THOMAS	W. Thomas & Co. (W.A.), Ltd.	Bran, pollard, wheaten chaff, molasses, salt, ground limestone	6.00	1.50	25.00	1.50	....	3.75	....	....
Horse Food	96	EVELYN	Tropical Traders, Ltd.	Pollard, linseed meal, linseed (whole), wheat, salt, chalk, sulphur, other minerals, and medicinal herbs	12.60	5.70	7.14	6.00	0.90	1.10	1.84	....
9.—Dog Foods.												
Dog Biscuits	38	BOANS LOCAL	A. E. Robinson	Wheat, bone, meat, vegetables	15.00	4.00	3.00	....	2.50	2.50	....	....
Charcoal Shapes	39	SNAPS	do. do.	Same as (38) plus charcoal	14.00	3.00	6.00	....	2.50	2.50	....	....
Puppy Meal	40	do.	do. do.	Wheat, bone, meat, vegetables	15.00	4.00	2.00	....	3.50	4.00	....	....
Plain Shapes	41	do.	do. do.	do. do. do.	15.00	4.00	2.00	....	3.50	1.50	....	....
Puppy Biscuits	42	do.	do. do.	do. do. do.	15.00	4.00	2.00	....	3.50	4.00	....	....
No. 1 Dog Biscuits	43	do.	do. do.	do. do. do.	15.00	4.00	2.00	....	3.50	4.00	....	....
C.—STOCK LICKS.												
1.—Mixed Stock Licks.												
Di-Calcic Phosphate	34	C.S.M.L.	Cuming Smith & Mt. Lyell F.F., Ltd.	Calcium phosphate at least 90% of the P_2O_5 being as Di-Calcic-phosphate	....	....	....	....	(Min.) 37.00	CaO. 28.00	.... (Min.) FE	.... (Min.) Cu
Denmark Lick Substitute	35	do.	do. do. do.	Limonite, sulphate of copper, salt	....	....	....	38.00	....	....	20.00	0.14

Di-Calcic Lick	36	do.	do. do. do.	Di-calcic, phosphate, salt, molasses	....	....	....	38.00	18.00	13.00	....	....
Copper Lick	37	do.	do. do. do.	Di-calcic phosphate, copper sulphate, salt	....	....		66.00	12.50		Cu 0.10	....
Cobaltised and Copperised Sheep Lick Concentrated "D"	84	VITA LICK	Goldsbrough, Mort & Co., Ltd.	Bone flour, bone charcoal, sodsulphate, sulphur, limonite, pot. iodide, copper sulphate, cobalt chloride, rice meal, cocoa meal, wheat meal	....	....	....	....	23.50	30.00	Iron 1.30	Sulphur 2.00
Cobaltised and Copperised Sheep Lick Concentrated "G"	85	do.	do. do. do.	Same as (84)	....	....	....	....	23.50	31.00	3.52	4.00
Cobaltised and Copperised Sheep Lick Mixed "G"	86	do.	do. do. do.	Same as (84) plus molasses	....	....	....	80.00	3.80	4.90	0.56	0.64
Cobaltised and Copperised Sheep Lick Mixed "D"	87	do.	do. do. do.	do. do. do.	....	....	....	80.00	3.70	4.70	0.18	0.32
Cobaltised and Copperised Cattle Concentrated "D"	88	do.	do. do. do.	Same as (84) less limonite	....	....	....	*Nil*	21.70	29.00	3.40	0.40
Cobaltised and Copperised Cattle Concentrated "G"	89	do.	do. do. do.	do. do. do.	....	....	....	*Nil*	25.00	32.50	4.70	1.15
Cobaltised and Copperised Cattle Mixed "D"	90	do.	do. do. do.	Same as (84) less limonite and plus molasses	....	....	....	75.00	4.20	5.40	0.64	0.08
Cobaltised and Copperised Cattle Mixed "G"	91	do.	do. do. do.	do. do. do.	....	....	....	75.00	4.40	5.80	0.88	0.22
Vitalick Mineral Mixture	92	V.M.M.	do. do. do.	Bone flour, bone charcoal, spanish iron oxide, ferrous sulphate, flowers of sulphur, sodium sulphate, rice and cocoanut meals	....	....	....	4.30	9.50	12.50	0.47	1.40
Vitalick Mineral Blocks	93	VITALICK MINERAL BLOCK	do. do. do.	Carbonate of lime, sulphur, sulphate of iron, salt, iodide and cobalt chloride	....	....	....	76.00	....	9.50	0.22	0.50
Chic-A-Vite	94	CHIC-A-VITE	do. do. do.	Same as (9) plus gentian, cod liver oil pot. iodide	....	....	....	*Nil*	20.70	27.60	1.80	1.80
Por-co-vite	95	POR-CO-VITE	do. do. do.	Bone flour, bone charcoal, sodium sulphate, flowers of sulphur, salt, limonite, limestone, copper sulphate, cobalt chloride, pot. iodide, cod liver oil	....	....	....	13.00	19.10	30.00	0.62	9.70
Medicated Lick	113	VETAMAC	A. H. McDonald & Co.	Salt, sulphate of iron, soda-bicarbonate, aloes, sulphur, wheat meal, molasses, other minerals	....	....	....	53.00	5.70	7.50	Iron 0.70	Sulphur 4.00
Mineral Concentrate	111	VETSOLICK	do. do. do.	Bone meal, pollard, sulphur, minerals	....	....	....	....	11.00	14.00	1.50	16.60
Di-calcic Lick	137	WESFARMERS	Westralian Farmers Co-op., Ltd.	Salt, di-calcic phosphate	....	....	....	60.00	15.00	11.00	....	....
Lime Lick	138	do.	do. do. do.	Salt, calcium carbonate	....	....	....	35.00	....	$CaCO_3$ 40.00	....	....

Stock Food.	Reg. No.	Brand.	By whom Registered.	Materials from which Made.	Registered Analysis.							
					Crude Protein.	Crude Fat.	Crude Fibre.	Sodium Chloride.	Phos. Acid (P_2O_5)	Lime.	Other.	
					% (Min.)	% (Max.)	% (Max.)	% (Max.)	% (Min.)	%	% Iron (Min.)	% Copper (Min.)
Stock Lick	139	WESFARMERS	Westralian Farmers Co-op. Ltd.	Salt, bone meal, minerals	....	....	....	80.00	0.85	15.00	0.17	0.12
Denmark Lick Substitute	140	do.	do. do. do.	Limonite, salt, copper sulphate	....	....	....	65.00	....	....	10.00	0.15
2.—*Bone Meals.*										CaO		
Bone Flour	24	CALPHOS	W. Thomas & Co. (W.A.), Ltd.	Bones	20.00	....	....	....	25.00	30.00	....	....
Bone Meal	26	WATTLE	Wattle Fertiliser Co.	do.	16.12	....	....	....	28.38	46.90	....	....
Do.	53	W.A.M.E.	W.A. Meat Export Works	do.	18.75	....	....	0.25	26.00	27.00	....	....
Sterilised Bone Flour	114	TRICALOS	Davis Gelatine (Aust.) Pty., Ltd.	do.	5.00	....	....	....	30.00	40.00	....	....
Bone Meal	142	ANCHO	Anchorage Butchers Pty., Ltd.	Waste meal product	23.63	2.44	Trace	....	26.76	26.95	....	....
Sterilised Bone Grit Meal	143	N.A.	W. Thomas & Co. (W.A.), Ltd.	Bones	20.00	....	....	....	15.00	20.00	....	....
Bone Meal	144	THOMAS	do. do. do.	do.	10.00	....	....	....	20.00	25.00	....	....

ANALYSES OF FEEDING STUFFS.

RESULTS of Analyses of samples of Feeding Stuffs taken under the Feeding Stuffs Act, 1928-1946.

(Published under section 9 of the Act.)

Date Sample taken.	Firm and Brand.	Crude Protein.	Crude Fat.	Crude Fibre.	Sodium Chlor.	Phosphoric Acid P_2O_5.	Lime.	Others.	
		%	%	%	%	%	%	%	%
	Barrow Linton & Co.								
	" Chic Chic " Chick Grain—								
	Reg. Analysis	†9.0	†2.7	*5.0	....	....	....	....	....
10–6–48	Sample Analysis	13.7	1.8	2.5	....	....	....	....	....
	" Egglayer " Laying Mash—						$CaCO_3$		
	Reg. Analysis	†14.0	†3.5	*4.5	1.0	....	3.0	....	....
30–4–48	Sample Analysis	18.1	4.6	4.4	0.50	....	2.33	....	....
	" Excelsior " Meat and Bone Meal—								
	Reg. Analysis	†40.0	*15.0	*1.5	....	....	....	....	....
30–4–48	Sample Analysis	39.9	10.0	0.5	....	....	....	....	....
	" Vitalizer " Chickstarter—								
	Reg. Analysis	†15.0	†4.0	*4.5	1.0	....	3.0	....	....
1–6–48	Sample Analysis	20.9	5.2	4.5	0.96	....	2.49	....	....
	" Daisy Food " Cow Food—								
	Reg. Analysis	†9.0	†2.5	*4.0	....	....	....	....	....
10–6–48	Sample Analysis	15.8	5.4	6.7	....	....	....	....	....
	J. & W. Bateman, Ltd.								
	" Patriot " Chick Food—								
	Reg. Analysis	†11.8	†3.0	*3.8	....	....	....	....	....
9–6–48	Sample Analysis	10.2	2.1	2.9	....	....	....	....	....
	David Gray & Co., Ltd.								
	" Western " Chickbuilder—								
	Reg. Analysis	†13.5	†2.5	*4.5	....	....	1.5	....	....
20–5–48	Sample Analysis	13.4	4.0	3.9	....	....	0.27	....	....
	" Western " Chickstarter—								
	Reg. Analysis	†14.5	†3.0	*4.5	....	....	1.5	....	....
25–5–48	Sample Analysis	13.7	5.3	4.6	....	....	0.4	....	....
	" Western " Fattening Mash—								
	Reg. Analysis	†11.0	†3.0	*5.0	0.5	....	1.5	....	....
3–6–48	Sample Analysis	12.2	2.4	4.7	0.17	....	0.58	....	....
	"Western" Laying Mash "B"—								
	Reg. Analysis	†11.0	†3.0	*7.0	0.5	....	1.5	....	....
2–6–48	Sample Analysis	12.6	2.3	4.4	0.16	....	0.26	....	....
	Goldsbrough, Mort & Co., Ltd.								
	" Vita Lick " Cobaltised and Copperised Cattle Lick Concentrated " G "—						CaO	Iron.	Sulph.
	Reg. Analysis	....	....	....	*Nil less than	†25.0	†32.5	†4.7	†1.15
9–6–48	Sample Analysis	....	....	....	0.01	24.5	33.0	4.9	1.56
	" Vita Lick " Cobaltised and Copperised Sheep Lick Mixed " D "—								
	Reg. Analysis	....	....	....	*80.0	†3.7	†4.7	†0.18	†0.32
9–6–48	Sample Analysis	....	....	....	77.8	3.6	5.2	0.50	0.10
	Kraft Walker Cheese Co. Pty., Ltd.							Lactose	
	" Krafco" Dried Whey Powder—								
	Reg. Analysis	†10·0	†0·5	....	....	1·0	0·7	68·0	....
19–5–48	Sample Analysis	12·4	0·5	....	....	1·42	0·98	67·3	....
	W. H. Milne & Co.								
	" Millers " Chickbuilder—						CaO		
	Reg. Analysis	†16.00	†4.72	*3.4	1.16	2.04	2.21	....	....
26–5–48	Sample Analysis	14.8	5.4	4.5	1.0	1.70	2.4	....	....
	" Millers " Chickstarter—								
	Reg. Analysis	†15.06	†4.34	*6.10	1.09	1.84	3.11	....	....
26–5–48	Sample Analysis	14.6	8.0	4.7	0.4	1.47	1.8	....	....
	Sims Cooper (Freezing Works) Pty. Ltd.								
	" Champion " Meat Meal—								
	Reg. Analysis	†50.0	*12.0	*5.0	....	....	....	....	....
1–6–48	Sample Analysis	52.3	11.4	1.1	....	....	....	....	....

* Maximum † Minimum.

ANALYSES OF FEEDING STUFFS—continued.

Date Sample taken.	Firm and Brand.	Crude Protein.	Crude Fat.	Crude Fibre.	Sodium Chlor.	Phosphoric Acid P_2O_5.	Lime.	Others.	
		%	%	%	%	%	%	%	%
	State Abattoirs.								
	"State Abattoirs" Midland Meat Meal—								
	Reg. Analysis	†51.0	14.0	*2.0	....	....	....	....	....
27–5–48	Sample Analysis	49.0	26.9	2.7	....	....	....	....	....
	W. Thomas & Co. (W.A.), Ltd.								
	"Thomas" Laying Mash No. 1—						Ca		
	Reg. Analysis	†14.0	†2.5	*6.0	1.5	....	3.75	....	....
2–6–48	Sample Analysis	15·4	3·9	4·5	1·49	....	2·15	....	....
	"Thomas" Quicklay—								
	Reg. Analysis	†35.0	*15.0	*4.0	*3.0	....	*15.0	....	....
26–5–48	Sample Analysis	39.7	15.5	1.6	1.8	....	13.9	....	....
	"Thomas" Sweet Dairy Food—								
	Reg. Analysis	†11.5	†1.5	*8.5	1.75	....	4.0	....	....
2–6–48	Sample Analysis	12.7	2.7	6.7	1.86	....	2.10	....	....
	Wattle Fertiliser Co.								
	"Wattle" Bone Meal—								
	Reg. Analysis	†16.12	†3.5	*5.01	....	28.38	46.9	....	....
16–6–48	Sample Analysis	25.6	6.0	1.7	....	22.8	30.1	....	....
	Westralian Farmers Co-op., Ltd.								
	"Wesfarmers" Laying Mash No. 1—						$CaCO_3$		
	Reg. Analysis	†14.0	†4.0	*7.0	0.5	....	2.5	....	....
24–5–48	Sample Analysis	13.4	5.0	3.7	0.7	....	3.2	....	
	"Wesfarmers" Laying Mash No. 2—								
	Reg. Analysis	†11.0	†3.0	*7.0	0.5	....	2.5	....	....
27–5–48	Sample Analysis	10.9	2.6	4.5	0.6	....	2.4	....	....
	"Wesfarmers" Protein Meal "B"—								
	Reg. Analysis	†35.0	†7.0	*4.5	....	....	....	15.0	....
25–5–48	Sample Analysis	36.0	8.4	1.5	....	....	....	14.9	....
	"N-A." Sterilized Bone Grit Meal—								
	Reg. Analysis	†20.0	*10.0	*1.0	....	....	....	....	....
3–6–48	Sample Analysis	20.1	8.5	1.9	....	....	....	....	....
	Wright's, Ltd.								
	"Wrights" Meat Meal—								
	Reg. Analysis	†40.0	*11.0	*1.5	....	14.2	....	....	....
1–6–48	Sample Analysis	44.9	7.6	0.5	....	14.0	....	....	....
	Robert. B. Young.								
	"Morlay" Chick Allmash—						CaO		
	Reg. Analysis	†14.0	†3.0	*6.0	1.0	2.0	5.0	....	....
20–5–48	Sample Analysis	15.9	4.0	3.0	0.74	2.56	3.03	....	....
	"Morlay" Fattening Mash "D"—								
	Reg. Analysis	†11.0	†4.0	*6.0	1.0	3.0	5.0	....	....
20–5–48	Sample Analysis	14.2	3.2	3.8	0.25	2.64	4.05	....	....

* Maximum. † Minimum.

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